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ABSTRACT

This curriculum guide was developed to aid vocational agriculture/agribusiness teachers in Louisiana in improving their instruction and to provide students with the opportunity to obtain skills and knowledge in the production of nontraditional specialty animals. The guide covers the techniques of production, management, care, and marketing of specialty animals. Animals included in the eight units of the curriculum are crawfish, catfish, bees, crickets and worms for bait, rabbits, bobwhite quail, pheasants, and dairy goats. Each unit begins with a brief introduction, competencies, general and specific performance objectives, methodology, suggested interest approaches, and a unit outline. Specific objectives are included for each topic. The content is organized to facilitate a logical presentation of information. Suggested student activities are provided for each objective to enable students to achieve the objective. Appendixes containing materials for visual aids are provided for some units. Each unit also includes unit tests and answer sheets, recommendations for evaluation and testing, a list of needed equipment and supplies, supplementary materials, and a resource section. (KC)

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Office of Vocational Education

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SPECIALTY ANIMAL PRODUCTION CURRICULUM

GUIDE FOR VOCATIONAL AGRICULTURE/AGRIBUSINESS

BULLETIN NO. 1806

PROJECT DIRECTOR

Dr. David C. Drueckhammer

Funded by
The State of Louisiana
Department of Education
Office of Vocational Education

University of Southwestern Louisiana

April, 1987

FOREWORD

This Curriculum Guide, Specialty Animal Production for Vocational Agriculture/Agribusiness, was produced as a result of a project funded by the Louisiana State Department of Education to the University of Southwestern Louisiana. This Unit represents the concerted efforts of Vocational Agriculture teachers throughout the State of Louisiana.

The Instructional Unit was developed for the express purpose of aiding experienced as well as beginning vocational agriculture/agribusiness teachers. The hope is that having these teaching materials will allow teachers to improve their instructional program as well as have increased time available to spend on other phases of the total vocational education program. Performance objectives, current instructional content, informational sources, and supplemental materials are provided in the Unit.

We believe this Unit will make a major contribution to the improvement of instruction in Vocational Agriculture/ Agribusiness in Louisiana.

Thomas G. Clausen

Thomas G. Clausen, Ph.D.
State Superintendent of Education

ACKNOWLEDGEMENTS

This publication represents the cooperative efforts of personnel in the Department of Agricultural Sciences, Technology and Education at the University of Southwestern Louisiana, and the Office of Vocational Education, Louisiana State Department of Education. Special recognition goes to Dr. David Drueckhammer who served as Project Director. Special commendation also goes to members of the writing team, who worked diligently to make this publication a reality.

Other highly significant contributions include Mrs. Beth LaBorde, Ms. Janice Meaux, and Mrs. Lisa Havard for typing of the document. Recognition is also due to Robert Simmons, State Supervisor of Vocational Agriculture/Agribusiness; Russell Sullivan, Vocational Agriculture/Agribusiness Supervisor (retired); and Gus Miller, Vocational Agriculture/Agribusiness Supervisor, who supported the project both directly and indirectly.

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SPECIALTY ANIMAL PRODUCTION
Eleventh and Twelfth Grades
10 Weeks

Course Description

An instructional program that provides individuals in high school vocational agriculture the opportunity to obtain skills and knowledge in the production of nontraditional specialty animals. It includes the techniques of production, management, care, and marketing of specialty animals. Animals included in the curriculum are crawfish, catfish, rabbits, bobwhite quail, pheasants, bees, dairy goats, and crickets and worms for bait. Prerequisites are Vocational Agriculture I and II. Enrollment is recommended for eleventh and twelfth grade students.

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RATIONALE

Many of our traditional production agricultural enterprises no longer provide an acceptable level of income for the producer of the agricultural product. Because of the low income levels from most of our traditional agricultural animals and crops, the production of nontraditional specialty animals is one alternative to raising the income of the State's agricultural producers. Several specialty animals are presently being produced in relatively large amounts and add significantly to the income of the people of the State of Louisiana. Several other specialty animals are produced in smaller numbers and provide potential for larger levels of profitable production.

In order to train high school vocational agriculture students and adults in the techniques of production, management, care, and marketing of specialty animals, this curriculum guide was developed. These curriculum materials provide information that will allow a larger number of students enrolled in vocational agriculture classes the opportunity to conduct Supervised Occupational Experience Programs using specialty animals.

DESIGN OF THE GUIDE

The Specialty Animal Curriculum Guide for Vocational Agriculture is composed of eight units. Each unit begins with a brief introduction, competencies, general and specific performance objectives, methodology, suggested interest approaches, and a unit outline.

Specific objectives are included for each topic. Each objective is separated from the other material with a line drawn above and below the objective. The content is organized to facilitate a logical presentation of information. Suggested student activities are provided for each objective to enable students to achieve the objective. Additional activities may be added by the teacher. The activities listed are to assist teachers in creativity.

Appendices for units are provided immediately following the unit. These may be used to make visual aids for classroom use. Following the appendices are unit tests and answer sheets. The tests may be duplicated for classroom use or may serve as a guide for the teacher in test development.

Each unit includes recommendations for evaluation and testing, a list of needed equipment and supplies, supplementary materials, and a resource section, which list references available to the teacher to supplement the curriculum guide.

Pages are numbered for each unit, e.g., a page numbered III-4 would be the fourth page of Unit III.

CONTENT OUTLINE

SPECIALTY ANIMAL PRODUCTION

ELEVENTH AND TWELFTH GRADES

Unit	Title	Suggested Time Schedule
Unit I	Crawfish Production	1 - 2 weeks
Unit II	Catfish Production	1 - 2 weeks
Unit III	Management of Bees for Honey Production	1 - 2 weeks
Unit IV	Crickets and Worms for Bait	4 - 6 days
Unit V	Raising Rabbits	1 - 2 weeks
Unit VI	Bobwhite Quail Production	3 - 4 days
Unit VII	Production of Pheasants	3 - 4 days
Unit VIII	Dairy Goat Milk Production	1 - 2 weeks
		10 weeks

UNIT I
CRAWFISH PRODUCTION

INTRODUCTION

Crawfish from naturally occurring sources have long been a food for people in South Louisiana. However, this source of crawfish has been undependable and does not provide an adequate supply. Pond crawfish farming has been developed to prevent erratic supplies, assure more controlled conditions, and to take advantage of high prices paid for the crawfish.

The purpose of this unit is to provide training relative to proper crawfish pond construction, crawfish production, and pond management.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon completion of this unit, students should be able to:

1. Identify proper crawfish reproduction terms.
2. Explain the diet of the crawfish.
3. Name serious predators of the crawfish.
4. Determine proper situations for good crawfish pond construction.
5. Select water quality considerations that are needed for good crawfish production.
6. Select proper crawfish production techniques.

SPECIFIC PERFORMANCE OBJECTIVES & MASTERY CRITERIA

1. Given a list of crawfish reproduction terms, students will be able to match a definition or answer to the correct term with at least 75% accuracy.

2. Given a written exam, students will be able to explain the diet of the crawfish and name serious predators to the crawfish with at least 75% accuracy.

3. Given situations dealing with crawfish pond site selection and pond construction, students will be able to determine if the situations are proper for good pond construction with at least 75% accuracy.

4. Given a list of water quality considerations, students will be able to select those that are needed for good crawfish production with at least 75% accuracy.

5. Given a list of possible crawfish pond management techniques, students will be able to select those techniques that are proper and recommended for crawfish production with at least 75% accuracy.

METHODOLOGY

This unit should be taught using a combination of methods. The instruction may include taking students on a field trip to a crawfish farm, providing specimens for students, observing and discussing in the classroom, using resource persons, and combining independent study with lecture and class discussion.

SUGGESTED APPROACHES

1. Provide samples of crawfish meat products that can be tasted by the students in the class to demonstrate the desirability of crawfish.

2. Plan a field trip to a crawfish farm so that students can observe the use of properly constructed and located ponds and the proper production techniques in use.

3. Secure specimens of crawfish and other materials important to crawfish production for use in classroom discussion.

4. Point out and direct a discussion on how crawfish production can add to the overall farm income.

UNIT OUTLINE

I. Crawfish Reproduction

   A. Species

   B. Breeding

   C. Egg Laying

   D. Young Crawfish

II. Diet and Predators of Crawfish

III. Pond Site Selection and Pond Construction

A. Rice Fields

B. Open Ponds

C. Wooded or Swampland Ponds

IV. Water Quality

A. Oxygen Levels

B. Water pH

C. Iron Concentrations

D. Chemical Contamination

E. Fertilization

V. Pond Management

A. Stocking

B. Flooding Ponds

C. Harvesting

D. Draining Ponds

SPECIFIC PERFORMANCE OBJECTIVES AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a list of crawfish reproduction terms, students will be able to match the correct definition or answer with the term with at least 75% accuracy.

UNIT CONTENT

Definitions

A. Crawfish: a freshwater crustacean like the lobster, but smaller.

B. Breeding: the begetting or producing of young.

C. Spawning: to produce or deposit eggs.

D. Burrow: a hole in the ground made by certain animals.

E. Predators: an animal which lives off of other animals.

F. Glair: sticky substance which keeps the eggs under the tail.

There are over 300 species of crawfish worldwide. They vary in size from the dwarf crawfish of Louisiana to an Australian species which attains a weight of 7 1/2 pounds. The crawfish is found on all continents except Africa.

The two species raised in Louisiana are the red swamp crawfish (Procambarus clarkii) and the white river crawfish (Procambarus acutus acutus). In Louisiana there were approximately 115,000 acres of crawfish ponds in 1986, as well as many additional acres in the Atchafalaya Basin.

The red swamp crawfish is farmed in greater numbers on most farms. The white river crawfish cannot tolerate extreme conditions of hot water and low dissolved oxygen as well as the red crawfish.

Breeding occurs in open water and peaks in late May and early June. The male deposits sperm into an external receptacle on the female. The sperm are held in this receptacle until the eggs are laid. Shortly after the peak of breeding season, a few female crawfish will "dig in" or burrow. Burrowing takes place on the shore near the waters edge. Aquatic plants in the pond and around the edge will reduce the number of females lost to predators. The remainder of the females will" dig in" when the crawfish ponds are being drained in the month of June. Some males will occupy burrows with females, while the other males go down into soft mud. For this reason, there are more males than females late in the season. Burrows are 24 to 36 inches deep. Female crawfish remain in the burrows for several months.

The egg laying period begins in September. Eggs are laid and simultaneously fertilized by the sperm held in the receptacle of the female. They are held in place on the underside of the female's tail by a sticky substance called glair. Red crawfish eggs hatch in 14 to 21 days while the white crawfish require an extra 3 to 8 days. Red crawfish average about 400 young and white crawfish somewhat fewer. Peak hatching occurs during October. Ponds should be flooded as an abundance of water is a critical requirement. The young crawfish are released by the female and immediately begin to feed and grow if water is present. Crawfish will undergo a minimum of nine molts following release from the mother before they mature.

Young crawfish occupy the shallow portions of the pond. The best water temperatures are thought to be 70 to 85 degrees F. If conditions are favorable, young crawfish may reach market size in 60 to 90 days. However, water temperatures below 50 to 55 degrees F will drastically reduce crawfish growth.

LEARNING ACTIVITIES

1. Collect specimens of red swamp crawfish, white river crawfish, a "cap" of a crawfish burrow, and immature crawfish to use for a discussion and demonstration on crawfish reproduction and species.

2. Arrange for a resource person to speak to your class on crawfish reproduction.

OBJECTIVE 2. Given a written exam, students will be able to explain the diet of the crawfish and name serious predators of the crawfish with at least 75% accuracy.

UNIT CONTENT

The diet of crawfish consists of dead and living plant and animal matter. For large crawfish, green vegetation is a necessity as it contains carotene which produces the bright yellow "fat."

Fish are the most serious predators in crawfish ponds flooded by surface water. Small fish can easily capture the small crawfish. In fact, one sunfish 3 inches long may consume 16 young crawfish in a 24-hour period. Other predators include grackles, bullfrogs, young alligators, raccoons, otters, mink, and wading birds. Heavy cover will reduce the number of crawfish lost to the above-mentioned predators. Examples of good cover include alligator weed and water primrose.

LEARNING ACTIVITIES

1. Prepare a bulletin board showing the predators of the crawfish.

2. Arrange for a science teacher to speak to your class on food sources of the crawfish.

3. Given situations dealing with crawfish pond site selection and pond construction, students will be able to determine if the situations are proper for good pond construction with at least 75% accuracy.

UNIT CONTENT

Definitions:

A. Levee: an embankment to prevent the flooding of land or to contain a body of water.

B. Pond: a body of water usually smaller than a lake.

C. Erosion: to wear away the land by the action of water.

There are generally three types of crawfish ponds.

A. Rice fields - crawfish are grown in rotation with rice in many areas. One problem with this type of pond is water depth. Rice is generally grown in about 6 inches of water, while crawfish require from 12 to 30 inches of water. Raising the levees should solve this problem.

B. Open Ponds - the only crop grown is crawfish.

C. Wooded or swampland ponds - natural swamp area which holds water.

A pond site should be land that is relatively flat. When the high ground in the pond is covered by 12 inches of water, depths of over 30 inches should not occur in more than 25% of the pond. Water depths should range from 12 to 30 inches. Dense stands of large tough plants are undesirable. These plants do not furnish a large amount of food for crawfish and are a hinderance to fishermen.

Levees should be wide enough to permit access to vehicles. Levees should be high enough to prevent nearby streams from overflowing into ponds during periods of high water. No portion of the pond should be larger than 300 acres. Large open ponds are subject to erosion problems on levees.

Screened drains must be provided to prevent the crawfish from leaving the pond. Screen holes should be of

1/2 inch or less in diameter. Drains should be located as far from the pump as possible.

LEARNING ACTIVITIES

1. Take a field trip to an area of crawfish production to evaluate and discuss pond sites and construction with your students.

2. Develop a slide set of different types of crawfish ponds and possible sites for ponds to use in a class discussion.

OBJECTIVE 4. Given a list of water quality considerations, students will be able to select those that are needed for good crawfish production with at least 75% accuracy.

UNIT CONTENT

Definitions:

A. Insecticide: chemical used to control insects.

B. Herbicide: chemical used to control weeds.

C. Treated Rice Seed: rice seed treated with chemicals for planting.

D. Aerator: a device which increases the oxygen level of water.

The exact water composition for optimum crawfish growth has not been determined, however several factors have been discovered. The primary water quality factor limiting crawfish pond culture is dissolved oxygen. Dissolved oxygen levels below 2 ppm can be fatal. By periodically checking the pond with an oxygen kit or oxygen meter, one can monitor the level. To increase oxygen levels water should be passed through some type of aerator.

Crawfish in acid waters tend to have thinner shells. Levels of pH ranging from 5.8 to 8.2 seem to be best. Crawfish seem to tolerate iron at concentration levels of 4 ppm. When higher concentrations of iron are found, water can be run down a canal and iron will dissipate rapidly if the water runs for some distance.

If water is pumped from bayous and canals, there is a danger that insecticides, herbicides, and other compounds

will have infiltrated some of these waters. Care must be taken to prevent fish kills from chemicals. Source water should be checked every 24 hours when pumping. Pilots should be told of the location of crawfish ponds. This will reduce the possibility of drift contamination. Farm chemicals are used to kill a wide variety of organisms. Insecticides are especially toxic to crawfish, as they are intended to kill insects which, like the crawfish, are arthropods. The best source of information concerning the advisability of using various pesticides in or near crawfish ponds is the Louisiana Cooperative Extension Service. An example of a few pesticides toxic to crawfish are as follows:

DDT
Endrin
Mirex
Methyl Parathion
Dursban
Propanil
Dieldrin

Fertilization of the water is a controversial subject. Most crawfishermen realize the need for dense stands of vegetation during the months when the pond is dry. A pond is fertilized to make the pond "bloom" with vegetation. This fertilization creates a large number of small water animals. However, studies indicate the bulk of the crawfish diet consists of vegetation. Determine the best type of plants and apply fertilizer if necessary during the dry months. Ponds plagued by dense algae (green scum) indicate the pond is too fertile. The use of treated rice seed in a rice/crawfish operation is not recommended. Some farmers claim that the treated seed has caused disappearance of crawfish. Crawfish should not be stocked less than 60 days after the last application of treated rice seed.

LEARNING ACTIVITIES

1. Have a resource person such as a Wildlife and Fisheries employee speak to your students on water quality in crawfish ponds.

2. Visit a lab where water quality tests are run or have a science teacher assist in conducting water quality tests with your class.

OBJECTIVE 5. Given a list of possible crawfish pond management techniques, students will be able to select those techniques that are proper and recommended for crawfish production with at least 75% accuracy.

UNIT CONTENT

Definitions:

A. Brood Crawfish - female crawfish which are used to repopulate the pond.

The pond manager must establish, maintain, and harvest the highest possible number of market-sized crawfish as early as possible during a season. This requires stocking of so called "brood" crawfish. Pond crawfish should be stocked in preference to Atchafalaya Basin crawfish. Crawfish that will be stocked in ponds should be stocked within several hours of capture. The most economical time to stock crawfish is late May to early June. The crawfish should be large, 12 - 18 to the pound. Stocking rates are as follows:

Situation	lbs/acre
Native crawfish in immediate area surrounding pond	20 - 25
Ponds with good cover, few or no crawfish in immediate area surrounding pond	20 - 25
Ponds with good cover	40 - 45
Ponds with sparse cover	46 - 65
Ponds with little or no cover	60 - 100

Crawfish ponds should be flooded by October 1. Water levels should remain constant throughout the growing season. Production can approach 2,000 pounds/acre/year. However, yields of 1,000 pounds/acre are considered good.

Crawfish harvesting usually begins in early December. Generally, harvesting is slow in December, but becomes abundant in the spring as most of the young reach harvestable sizes. Crawfish are caught with a device that utilizes bait to attract them. The standard commercial methods for catching crawfish is to use traps made from 3/4 inch hexagonal mesh chicken wire. If smaller crawfish are accepted, 1/2 inch and 5/8 inch mesh is sometimes used. There are a number of designs but they are all basically cylindrical and 30 to 36 inches long by 18 inches in diameter, with one to as many as four funnel-shaped entrances. The entrances have openings that are 1 1/2 to 2 1/2 inches in diameter. Research seems to indicate that traps with 3 or 4 entrances will catch more crawfish than traps with only 1 or 2 entrances. Traps are frequently coated with black net coating material to preserve them by preventing rust. They also seem to be more efficient than noncoated traps. Baits used in crawfish traps will vary depending on cost, availability and season. Gizzard shad is a popular bait. It is usually recommended that it be used during cool weather. As the weather warms up, artificial baits are usually used, since they seem to work better than fish. Research is continuing on new methods of harvesting as well as on new artificial baits.

Boats of some type are needed to travel in crawfish ponds. Several types are used in Louisiana. One type is a small boat propelled by a "go devil." A go devil consists of a small air-cooled engine with a weedless propeller on a long shaft connected to the drive shaft.

Air boats are used to harvest crawfish by some farmers; as well as the Mud Bug which is a four-wheeled vehicle developed to check crawfish traps. It consists of a raised platform with four wide tires powered by a large air-cooled engine. It has four-wheel drive and full foot pedal control, leaving the hands free. The Cajun Combine is a flat bottom boat with a low mounted notched wheel which pulls the boat through the pond. This wheel is rotated by hydraulic pressure. Hydraulic fluid also drives a piston that is used to turn the drive wheel and steer the boat. It is powered by an air-cooled engine.

Crawfish are packed in mesh sacks which hold approximately 35 to 40 pounds/sack. Crawfish can be stored alive for several days if temperatures remain between 40 and 45 degrees F.

Ponds are slowly drained at the end of the harvesting season. This should occur during the month of June. Slow draining will allow young crawfish to find soft mud in which to survive the summer. It also gives adults time to find suitable burrowing areas. Quick drainage will expose crawfish to predators. Draining ponds permits a new growth

of vegetation. It is recommended that ponds needing vegetation be planted with untreated waste rice, milo, or millet late enough to ensure that no seed heads are present at flooding time.

LEARNING ACTIVITIES

1. Take a field trip to a crawfish farm to observe and discuss production techniques being used.

2. Have a crawfish farmer speak to your class, as a resource person, to discuss production techniques and management.

UNIT I TEST

1. Match the following:

____ Procambarus clarkii

____ Procambarus acutus acutus

____ Spawning

____ Breeding

____ Predator

____ Time when breeding occurs

____ Time when egg laying begins

____ Glair

____ Time required for white crawfish eggs to hatch

____ Time required for red crawfish eggs to hatch

____ Time required for young crawfish to reach market age

a. 14 to 21 days

b. 17 to 29 days

c. 60 to 90 days

d. red swamp crawfish

e. white river crawfish

f. September

g. May

h. to produce or deposit eggs

i. sticky substance which keeps the eggs under the tail

j. an animal which lives off of other animals

k. the begetting or producing of young

2. Explain the diet of the crawfish.

3. Name five serious predators in crawfish ponds.

4. True or False

____ a. To wear away the land by the action of water is called erosion.

____ b. Crawfish require from 30 to 60 inches of water.

____ c. Large open ponds are subject to erosion problems.

____ d. Drains should be located near the pump

____ e. In some areas crawfish are grown in rotation with rice.

____ f. Dense stands of large tough plants are desirable in crawfish ponds.

5. Check the water quality considerations that are proper for good crawfish production.

____ a. dissolved oxygen levels below 2 ppm

____ b. pH levels ranging from 5.8 to 8.2

____ c. source waters checked for insecticides every 24 hours

____ d. high levels or dense algae

____ e. crawfish should not be stocked less than 60 days after the last application of treated rice seed.

6. Check from the list below those techniques that are proper and recommended for crawfish production.

____ a. The most economical time to stock crawfish is late April to early May.

____ b. Crawfish ponds should be flooded by October 1.

____ c. Crawfish harvesting begins in early October.

____ d. Ponds should be drained in the month of June.

____ e. Crawfish can be stored for several days if temperatures remain between 40 to 45 degrees F.

____ f. Crawfish ponds should be drained rapidly.

____ g. When ponds are drained they should be planted in rice, milo, or millet.

UNIT I TEST
ANSWER KEY

1. d
   e
   h
   k
   j
   g
   f
   i
   b
   a
   c

2. Green vegetation is a necessity for mature crawfish. The diet consists of dead and living plant and animal matter.

3. Fish, grackles, bullfrogs, young alligators, raccoons, otters, mink, and wading birds.

4. a. T
   b. F
   c. T
   d. F
   e. T
   f. F

5. b
   c
   e

6. b
   d
   e
   g

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class Participation

*Students Demonstrating Skills

*Unit Test

EQUIPMENT AND SUPPLIES

Student

Reference Materials
Notebook

Teacher

Crawfish and Crawfish Products
Reference Material
Slides of Pond Sites, Ponds, and Crawfish Production Techniques
Slide Projector
Crawfish Specimens for Species and Biological Study

Bulletin Board Ideas

Prepare a bulletin board using reference materials listed in the supplementary section of this lesson.

SUPPLEMENTARY MATERIALS

Reference Booklets

LaCaze, C. Crawfish. Louisiana Department of Wildlife and Fisheries, Baton Rouge.

Huner, J. and J. Barr. Red Swamp Crawfish. Sea Grant Communications, Center for Wetland Resources, Louisiana State University, Baton Rouge.

LaCaze, C. Crawfish Farming. Louisiana Department of Wildlife and Fisheries, Baton Rouge.

Louisiana Seafood Delight - The Crawfish. Louisiana Cooperative Extension Service, Baton Rouge.

Bretanne, L.D. and J.F. Fowler. The Louisiana Crawfish Industry - Its Problems and Solutions. Louisiana Cooperative Extension Service, Baton Rouge.

Roberts, K.J. Financial Information for Crawfish Farming. Louisiana Cooperative Extension Service, Baton Rouge.

Romaire, R.P., A.P. Vernon and A. Granados. Catch Efficiency of Commercial Crawfish Traps. Louisiana Cooperative Extension Service, Baton Rouge.

UNIT II
CATFISH PRODUCTION

INTRODUCTION

Economic data and analysis indicates that catfish farming represents a production alternative for Louisiana farmers. The state's abundant water resources and a relatively mild climate provide an excellent basis for catfish production.

The purpose of this unit is to provide training and information relative to proper stocking rates, feeding, harvesting, marketing, fish health management, and pond construction for catfish production.

COMPETENCIES

To properly feed, stock, harvest, market construction ponds, and provide a healthful environment for catfish production.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon completion of this unit, students should be able to:

1. List factors that are important to the selection of a site for a catfish production pond.
2. Select factors that are important in proper pond construction for catfish production.
3. Select proper stocking rates for different types of operations.
4. Determine the fertilizer needs of catfish ponds for proper production.
5. List proper feeding guidelines for catfish.
6. List causes of mortality and reduced production in catfish.
7. List methods used to keep catfish healthy.
8. List proper harvesting methods for catfish.
9. List marketing options for catfish.

SPECIFIC PERFORMANCE OBJECTIVES AND MASTERY CRITERIA

1. Given a written exam, students will be able to list factors that are important to the selection of a site for a catfish production pond with at least 75% accuracy.

2. Given a list of factors, students will be able to select the ones that are important in proper pond construction for catfish production with at least 75% accuracy.

3. Given situations in class, students will be able to select proper stocking rates for different types of catfish operations with at least 75% accuracy.

4. Given situations in class, students will be able to determine the fertilizer needs of catfish ponds for proper production with at least 75% accuracy.

5. Given a written exam, students will be able to list proper feeding guidelines for catfish with at least 75% accuracy.

6. Given a written exam, students will be able to list causes of mortality and reduced production in catfish with at least 75% accuracy.

7. Given a written exam, students will be able to list methods used to keep catfish healthy with at least 75% accuracy.

8. Given a written exam, students will be able to list proper harvesting methods for catfish with at least 75% accuracy.

9. Given a written exam, students will be able to list marketing options for catfish with at least 75% accuracy.

METHODOLOGY

This unit can be taught by using a variety of methods. The instruction may include visiting a catfish farm, a fish market, and a fish processing plant. Other instructional methods such as securing catfish to use in demonstrations at your vocational agriculture building, resource persons, independent study, along with lecture and class discussion should also be effective.

SUGGESTED APPROACHES

1. Plan field trips to a catfish farm, a fish market, and a fish processing plant to observe and discuss the techniques and procedures being used in catfish production, processing, and marketing.

2. Secure catfish for transporting to your vocational agriculture building to demonstrate and/or point out procedures used in production, marketing, processing, and health management of catfish.

3. Provide sound filmstrips on fish farming and fish health management.

4. Point out and direct a discussion with students on the price of catfish and human dietary and health considerations compared with those of other sources of meat.

5. Prepare a bulletin board on the topic of catfish production.

UNIT OUTLINE

I. Selection of Pond Site
   - A. Soils
   - B. Drainage
   - C. Water Source
   - D. Controlling Pond Traffic

II. Pond Construction
   - A. Size
   - B. Shape
   - C. Basic Requirements

III. Stocking, Fertilizing, and Feeding

IV. Fish Mortality

V. Diseases and Parasites
   - A. Causes
   - B. Treatment

VI. Harvesting

VII. Marketing

SPECIFIC PERFORMANCE OBJECTIVE AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a written exam, students will be able to list factors that are important to the selection of a site for a catfish production pond with at least 75% accuracy.

UNIT CONTENT

Selection of Pond Site:

A. Soils must contain enough clay to hold water. This should be determined to a soil depth of four feet.

B. Drainage should be able to be completed without crossing other land or ponds.

C. It is preferred to use well water for flooding to prevent introduction of "wild" fish, diseases, parasites and fish eggs. If surface water is used it should be screened.

D. The pond should be constructed in a location where poaching by animals and humans may be controlled.

E. Accessibility to all weather roads is necessary for pond maintenance and supervision.

F. The pond must be constructed at elevations high enough to prevent backwater flooding from streams.

G. A 1/4 mile buffer zone from other farming operations is preferred to minimize the effect of insecticide and pesticide drift.

H. Old fields need to be tested for pesticide residues. Special attention should be paid to residues of Endrim, Toxaphene, DDT, and Trifluralin.

LEARNING ACTIVITIES

1. Take a field trip to a catfish production unit to review and discuss considerations for the selection of a site for construction of ponds for production.

2. Have a resource person such as a catfish farmer or a soil conservation service person speak to your class about pond construction.

OBJECTIVE 2. Given a list of factors, students will be able to select the ones that are important in proper pond construction for catfish production with at least 75% accuracy.

UNIT CONTENT

Pond Construction

A. Effects of Wind

1. Small ponds should be constructed with the long axis parallel to the wind to maximize natural aeration.

2. Large ponds should be constructed with the long axis at right angle to prevailing winds to reduce wave action and levee erosion.

B. Effects of Shape

1. Square ponds are more easily built because of shorter levees.

2. Rectangular ponds are easier to harvest, have greater feeding area, and are more adaptable to wind effects.

3. Recommendations are that ponds be three times as long as they are wide.

C. Basic Pond Requirements

1. Ponds from 5 to 40 acres are most successful.

2. An inside levee slope of 3 to 1 is preferred for easier operation.

3. Levee crown should be a minimum of 10 feet, and main levees should be graveled.

4. All stumps must be removed and levees sodded.

5. An average pond depth of 4 feet is recommended but no area should be shallower than 30 inches.

6. A catch basin with a level bottom at least one foot deeper than the rest of the pond should be constructed at the drain end of the pond.

7. The drain must be screened and be of sufficient size to quickly draw down the water level in the pond.

LEARNING ACTIVITIES

1. Show and discuss a filmstrip on catfish production with your class.

2. Take a field trip to a catfish farm or to a farm where suitable ponds exist to discuss pond construction.

3. Invite a catfish farmer or other resource person to your class to discuss pond construction with your students.

OBJECTIVE 3. Given situations in class, students will be able to select proper stocking rates for different types of catfish operations with at least 75% accuracy.

UNIT CONTENT

Stocking Ponds:

A. For beginners it is preferable to purchase fingerlings rather than attempting to raise one's own.

B. Stocking rates vary according to management practices and experience of the pond manager. Basic rates are:

1. In unfed ponds use stocking rate of 300 fingerlings per acre.

2. In fed ponds, beginners should use a stocking rate of 1,000 to 1,500 fingerlings per acre.

3. With experienced operators and fed ponds maximum production is at a rate of 2,000 fingerlings per acre.

C. Spring stocking is recommended because of the scarcity of food during winter. If feeding, September and early October stocking are possible but expect losses because fish are unable to find the food during the winter.

LEARNING ACTIVITIES

1. Secure different sizes of catfish to use in a discussion of the effects of stocking rates on growth.

2. Lead a discussion on stocking rates pointing out the effects of feeding fish and not feeding fish.

OBJECTIVE 4. Given situations in class, students will be able to determine the fertilizer needs of catfish ponds for proper production with at least 75% accuracy.

UNIT CONTENT

Fertilizing:

A. Initial application should be 50 pounds of 16-20-0 water soluble fertilizer per acre in February.

B. Additional applications should be made at the same rate when a 6 inch white disc is clearly visible below 18 inches of water.

C. Caution: Do not overfertilize.

LEARNING ACTIVITIES

1. Lead a discussion on the proper fertilization of catfish ponds.

OBJECTIVE 5. Given a written exam, students will be able to list proper feeding guidelines for catfish with at least 75% accuracy.

Feeding:

A. Commercially prepared feeds with a minimum of 30 percent protein, 6 percent fat and a maximum of 15 percent fiber content should be used. Meal types of feeds are fed to small fingerlings and pelleted feeds to larger fish.

B. Changing brands or formulations causes fish to go "off feed" for three to seven days and reduces growth.

C. Rate of feeding is 3 to 5 percent of body weight for fish below one pound and 2 percent of body weight for larger fish.

D. Be careful not to overfeed because the uneaten feed will decay and reduce oxygen levels.

E. General feeding guidelines:

1. Do not overfeed.

2. Do not feed in the rain.

3. Reduce feeding rates by 1/2 when water temperature is above 90 degrees F.

4. Cease feeding if there are more than four consecutive days of overcast weather. Resume after first day of sunshine.

5. Split feedings give maximum growth. If feeding only once, feed in evening.

6. Feed in waters less than 3 feet in depth.

7. Avoid feeding during high humidity and low pressure.

8. Cover at least 10 percent of pond area during feeding.

9. Do not exceed 30 pounds of feed per acre during summer.

10. When temperatures are below 60 degrees F, feed twice a week at 1 percent of body weight.

11. If fish go off feed, find out why and correct it before resuming feeding.

12. Do not feed at least 24 hours before harvesting.

LEARNING ACTIVITIES

1. Take a field trip to a catfish farm to observe and discuss feeding procedures.

2. Show and discuss a filmstrip on catfish production.

3. Lead a discussion with the class on the feed needs of catfish and how this compares with the needs of other types of farm animals.

OBJECTIVE 6. Given a written exam, students will be able to list causes of mortality and reduced production in catfish with at least 75% accuracy.

UNIT CONTENT

Causes of Mortality:

A. Lack of oxygen in water may be caused by shallow water, overfeeding, overcrowding, successive cloudy days, die-off of plankton, or a combination of these. Remedies are:

1. Use of aeration pumps.

2. Pumping cool-oxygenated water to lower temperatures and increase oxygen.

3. In extreme cases potassium permanganate may be added to pond water, but great care must be taken because excess will kill fish.

B. Disease and Parasites:

1. Most diseases and parasites can be identified only by an experienced biologist.

2. Proper identification is necessary for proper treatment.

3. Most external parasites can be controlled by addition of formaldehyde at a rate of 15-25 ppm.

LEARNING ACTIVITIES

1. Lead a discussion on causes of mortality and reduced production in catfish.

2. Have a resource person such as a person from the Wildlife and Fisheries Department speak to your class on this topic.

OBJECTIVE 7. Given a written exam, students will be able to list methods used to keep catfish healthy with at least 75% accuracy.

UNIT CONTENT

The best treatment is to keep fish healthy. There are five basic steps to keeping fish healthy:

1. Buy clean fish.

2. Keep fish clean.

3. Feed fish well, but not excessively, daily.

4. Supply them with plenty of fresh water.

5. Do not overcrowd.

LEARNING ACTIVITIES

1. Take a field trip to a catfish farm to observe and discuss methods used to keep the fish healthy.

2. Have a resource person speak to your class on this topic.

3. Show a filmstrip on fish health management.

OBJECTIVE 8. Given a written exam, students will be able to list proper harvesting methods for catfish with at least 75% accuracy.

UNIT CONTENT

Because of rapid spoilage, fluctuation in prices and changes in supply, it is necessary to locate markets before harvesting.

Types of Harvesting:

A. Partial Harvesting

1. Use of seine nets to encircle and capture fish. Nets should be 1/3 to 1/2 deeper than water to be seined.

2. Basket traps are baited with stink bait to lure fish into traps, then they are removed from the ponds. This can only be used where small quantities are needed.

3. Trammel and gill nets are not recommended because they cause great losses from death and injury.

B. Total Harvesting

1. In total harvesting, the entire pond is seined. The water level is lowered to complete the harvesting.

Holding Tanks

A. Holding tanks may be made of wood, metal or concrete. Each has disadvantages.

1. Wood must be painted with waterproof paint or coated with fiberglass to prevent rotting.

2. Metal must be coated with a rust inhibitor.

3. Concrete causes abrasions and must be lined with plastic.

4. Caution: do not use poisonous metals such as lead, zinc, and copper.

Hauling Trucks

A. Hauling trucks are usually aluminum coated with fiberglass.

LEARNING ACTIVITIES

1. Visit a catfish farm to observe and discuss harvesting procedures being used.

2. Show and discuss a filmstrip on modern fish farms.

3. Have a resource person speak to your class about methods used and procedures in harvesting catfish.

OBJECTIVE 9. Given a written exam, students will be able to list marketing options for catfish with at least 75% accuracy.

UNIT CONTENT

Marketing Outlets:

A. Processing plants may handle as much as 10,000 pounds daily and offer premium prices; however, the nearest plants are in Mississippi and Arkansas.

B. Conventional fish markets will purchase fish but do not provide premium prices. Also, you must compete directly with "wild fish."

C. Fee fishing may secure the best prices. The typical system has a flat fee to fish plus an additional fee per pound for fish caught.

D. On-farm processing may be another option. Fish are sold fresh and usually dressed to order. This usually commands a higher price, but there are also greater labor costs as well as that of providing sanitary handling facilities.

LEARNING ACTIVITIES

1. Visit a fish market to observe and discuss marketing techniques being used.

2. Visit a fish processing plant to observe procedures being used.

3. Have a catfish farmer come to your class to discuss catfish marketing procedures.

UNIT II TEST

1. List four factors that are important to the selection of a site for a catfish production pond.

2. From the characteristics listed, check those that are important for proper pond construction and catfish production.

   ____ a. small ponds should be constructed with the long axis at a right angle to prevailing winds.

   ____ b. ponds from 5 to 40 acres are most successful.

   ____ c. levee crown should be a minimum of 10 feet.

   ____ d. average pond depth should be 4 feet.

3. Match the following situations with the proper stocking rates of fingerling catfish.

____ unfed ponds	a. 2000 per acre
____ fed ponds, inexperienced manager	b. 300 per acre
____ fed ponds, experienced manager	c. 1,500 per acre

4. Initial applications of fertilizer in catfish ponds should be _____ pounds per acre of 16-20-0.

   a. 25
   b. 50
   c. 75
   d. 100

5. List eight guidelines for proper feeding of catfish.

6. List four causes of mortality and reduced production in catfish.

7. List four methods used to keep catfish healthy.

8. List three proper harvesting methods used in catfish production.

9. List four marketing options for catfish.

UNIT II
ANSWER KEY

1. a. Soils must contain enough clay to hold water.

   b. Drainage should be able to be completed without crossing other land or ponds.

   c. Preference is well water for flooding.

   d. Location should be where poaching by animals and humans may be controlled.

   e. Accessibility to all-weather roads.

   f. Elevation high enough to prevent backwater flooding.

   g. 1/4 mile buffer zone from farming operations.

   h. Test old fields for pesticide residues.

2. b
   c
   d

3. b
   c
   a

4. b

5. a. Use commercially prepared feeds with a protein of 30%, 6% fat, and no more than 15% fiber.

   b. Don't change feed.

   c. Feed 3% to 5% of body weight for fish below one pound and 2% of body weight for larger fish.

   d. Do not overfeed.

   e. Do not feed in the rain.

   f. Reduce feeding rates by 1/2 when water temperature is above 90 degrees F.

   g. Cease feeding if there are more than four days of overcast weather.

h. Split feedings give maximum growth.

i. If feeding only once per day, feed in the evening.

j. Feed in waters less than 3 feet deep.

k. Avoid feeding during high humidity and low atmospheric pressure.

l. Cover at least 10% of pond area during feeding.

m. Do not exceed 30 pounds of feed per acre during summer.

n. When temperatures are below 60 degrees F, feed twice a week at 1% of body weight.

o. If fish go off of feed find out why and correct it before resuming feeding.

p. Do not feed at least 24 hours before harvesting.

6. a. Lack of oxygen caused by:
   1. shallow water
   2. overfeeding
   3. overcrowding
   4. successive cloudy days
   5. die-off of plankton

   b. diseases

   c. parasites

7. a. Buy clean fish.

   b. Keep fish clean.

   c. Feed fish well.

   d. Provide plenty of fresh water.

   e. Do not overcrowd.

8. a. Partial harvesting using seine nets.

   b. Partial harvesting using basket traps.

   c. Total pond harvesting.

9. a. Selling to processing plants.

b. Conventional fish markets.

c. Fee fishing.

d. On-the-farm processing.

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class Participation

*Completing unit test with 75% accuracy

*Completing written exercise on the topic

EQUIPMENT AND SUPPLIES

Brochures
Pamphlets
Filmstrip projector and cassette tape player
Cassette sound filmstrips

SUPPLEMENTARY MATERIALS

Reference Book

Lee, J.S. Commercial Catfish Farming. The Interstate Printers and Publishers, Inc. P. O. Box 50, Danville, IL 61834.

Reference Pamphlets

Available from Louisiana Cooperative Extension Service:

Economics of Catfish

Planning and Constructing Catfish Ponds in Louisiana

Available from Louisiana Wildlife and Fisheries Commission:

Channel Catfish Farming in Louisiana

Filmstrips with Cassette Sound

Available on the following subjects through Vocational Education Productions, California Polytechnic State University, San Luis Obispo, CA 93407.

Modern Fish Farms
Fish Health Management

UNIT III
MANAGEMENT OF BEES FOR HONEY PRODUCTION

INTRODUCTION

The opportunity to add to the family income or provide a food for the family exists through the management of honey bees. Opportunities may exist for a person to grow into full-time employment with the production of honey. Only a small initial investment may be needed. The successful beekeeper must be aware of the proper procedures and equipment needed for bee management and honey production.

The purpose of this unit is to provide training relative to proper management and housing of honey bees as well as the removal of honey and the readying of it for sale.

COMPETENCIES

The management of honey bees to include establishment, equipment, working the hive, seasonal management, swarm prevention, feeding, uniting colonies, and honey removal and its care.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon the completion of this unit, students should be able to:

1. Explain the methods used in establishment of honey bee colonies.
2. List the equipment needed by a honey bee keeper.
3. Determine proper procedures used in beekeeping.
4. List the characteristics and functions of the different costs of bees.
5. List seasonal management practices.
6. Introduce a new queen bee to a colony.
7. Explain proper methods used for feeding a colony of bees.
8. Explain methods used for swarm prevention.

9. Unite two colonies of bees properly.

10. Remove honey and care for it properly.

SPECIFIC PERFORMANCE OBJECTIVES AND MASTERY CRITERIA

1. Given a written exam, students will be able to explain the methods used in establishment of honey bee colonies with 75% accuracy.

2. Given a written exam, students will be able to list the equipment needed by a beekeeper with at least 75% accuracy.

3. When given possible beehive working procedures, students will be able to select those procedures that are proper for good beekeeping with at least 75% accuracy.

4. Given a list of bee characteristics and functions, the student will be able to match these with the proper caste of the bee with at least 75% accuracy.

5. Given a list of seasonal bee management practices, the student will be able to match the proper season with the management practice with at least 75% accuracy.

6. Given a list of steps used in the introduction of a new queen bee to a colony, students will be able to place the steps in proper order with at least 75% accuracy.

7. Given a written exam, students will be able to explain the method used for swarm prevention of honey bees with at least 75% accuracy.

8. Given a written exam, students will be able to explain the proper methods used for feeding a colony of bees with at least 75% accuracy.

9. Given a list of steps to be followed in uniting two colonies of bees, students will be able to place the steps in proper order with at least 75% accuracy.

10. Given a list of possible procedures for honey removal and care, students will be able to select the proper procedures with at least 75% accuracy.

METHODOLOGY

This unit can be taught by using a combination of methods. The instruction may include bringing bees, bee equipment and honey to the vocational agriculture facilities. Demonstrations, field trips, resource persons, and independent study may be used along with lecture and

class discussions. Care must be taken to protect students from bee stings.

SUGGESTED INTEREST APPROACHES

1. Provide samples of honey that can be tasted by the students in the class to demonstrate the quality and desirability of the product.

2. Discuss the profit potential of honey production with the class.

3. Plan a field trip to a honey production unit so that students can see proper production techniques.

4. Prepare a bulletin board on beekeeping.

5. Have a resource person speak to your class on beekeeping.

SPECIFIC PERFORMANCE OBJECTIVE AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a written exam, students will be able to explain the methods used in establishment of honey bee colonies with 75% accuracy.

SUBJECT MATTER CONTENT

The beginning beekeeper should start out with one or two colonies to learn the skills of beekeeping. After the person becomes experienced, additional colonies may be added. Care should be taken in locating the colonies in an area away from insecticides, as honey bees are easily killed.

Honey bee colonies are often established by capturing a swarm. A hive containing either combs or frames of foundation must be ready in advance of the capturing of a swarm. A swarm should be at least the size of a basketball to establish a working colony. If the hive is smaller, it will need to be added to an established colony. Sprinkle sugar syrup over bees in the colony and new bees to be added to cut down fighting. The stronger of the two queens will survive. Feed sugar syrup to new colonies for a few days to aid in establishment.

Established honey bee colonies can be purchased, and purchasing is often the quickest and easiest way to get into production. Colonies must be inspected by the State Entomologist before they can be moved to assure the health of the colonies. Colonies purchased should have a laying queen, worker brood, several pounds of worker bees, from 10 to 20 pounds of honey, and some pollen. The wooden equipment should be of adequate size and in good condition.

Packaged bees can also be ordered as a source for starting honey production. Order a 3 pound package and a queen bee. March or April is generally the best time to order packaged bees.

When the bees arrive, put them in a cool, shady place. Feed each package about a cupful of sugar syrup in the morning and again about an hour before dark.

If available, place two or three combs of disease-free honey and pollen in the hive with the package. If only empty combs are available, feed the bees sugar syrup. This will help the new colony to become established. Take the package to the hive, remove the feeder can and the queen cage from the package. Remove the small piece of cardboard from the candy end of the queen cage and make a tiny hole through the candy with a small nail. Place the queen cage, candy end up, between two frames and push the frames tightly together so that the cage cannot fall. Shake all of the bees out of the package over the queen cage, put in the remaining 8 frames, replace the inner cover, put an inverted friction top can of syrup over the hole in the inner cover, place an empty hive body over the inner cover, and put on the outer cover. Partially cover the hive entrance to prevent robbing by bees from other colonies.

Fill the feeder when needed, but otherwise do not disturb the colony for about one week. Then check to see if eggs and larvae are present; if not the queen may be dead. Get another queen as soon as possible, or combine the colony with another that has a laying queen.

LEARNING ACTIVITIES

1. Order established colonies and/or packaged bees for demonstration with students.

2. Take students on a field trip to a beekeeper.

3. Lead a discussion on what might be the most practical method for students to get started in beekeeping.

4. Pass out brochures and pamphlets pertaining to beekeeping.

OBJECTIVE 2. Given a written exam, students will be able to list the equipment needed by a beekeeper with at least 75% accuracy.

SUBJECT MATTER CONTENT

A hive should consist of:

a. a bottom board
b. inner cover
c. outer cover
d. 2 standard 10-frame hive bodies (supers)
e. 10 sheets of foundation for each body
f. 10 frames for each body

Equipment needed to work bees:

a. bee veil
b. bee smoker
c. hive tool (for manipulating the combs and hives)
d. bee brush
e. comb uncapping knife
f. two-frame honey extractor

LEARNING ACTIVITIES

1. Take students on a field trip to see the equipment of a beekeeper.

2. Bring bee equipment into the classroom.

3. Use overhead transparencies of bee equipment (Appendices A and B).

4. Show a filmstrip, cassette tape presentation on bees.

OBJECTIVE 3. When given possible beehive working procedures, students will be able to select those procedures that are proper for good beekeeping with at least 75% accuracy.

When working the hive:

a. Wear lightweight, light-colored clothes.
b. Wear thick, white socks with trouser legs tucked inside them.
c. Wear canvas gloves or rubber kitchen gloves
d. Use a well-burning smoker, fueled by dry, rotten wood, coarse shavings, pine straw, cotton waste or fairly loose rolls of old burlap bags.
e. Wear a black cloth or wire screen bee veil.
f. If stung, scrape the stinger out, do not pull it out as this will squeeze additional venom into your flesh.
g. Stand to the side or back of the hive in order not to be in the flight path of foraging bees.
h. Work bees during the middle of the day, while nectar is being gathered.
i. Movements should be slow and deliberate.
j. Avoid bungling and jarring actions.

When opening a hive of bees, follow these steps:

a. Blow a few puffs of smoke into the entrance
b. Remove the outer cover and lay it upside down on the ground near the hive.
c. Loosen the inner cover and puff enough smoke over the tops of the frames to drive bees down.
d. Remove the inner cover.
e. Examine the combs of the top super.
f. Pry loose the top super and set it across the upturned cover to examine the next super.
g. Use as little smoke as necessary to keep bees under control.
h. Never leave a comb of unsealed brood in direct sunshine or cold wind for too long.
i. When examining the queen, be careful not to lose, injure, or kill her.

When examining a colony of bees, check for the following:

a. solid brood pattern
b. amount of brood and honey present
c. general condition of colony
d. work needed in the near future
e. whether the colony is likely to be ready for honey flow or for wintering
f. if the queen is laying in an irregular pattern or shows signs of failing and needs to be replaced

Foundation in the frames should never be given to a colony when there is no immediate prospect of a good honey flow.

LEARNING ACTIVITIES

1. Show a filmstrip-cassette tape presentation on bees.

2. Go through the steps of beehive working conditions with a hive with no bees in it.

3. Discuss proper procedures with class.

4. Show and discuss slides with students.

OBJECTIVE 4. Given a list of bee characteristics and functions, the student will be able to match these with the proper caste of the bee with at least 75% accuracy.

SUBJECT MATTER CONTENT

Life Cycle (In Days)

Caste	Egg	Larvae	Pupa	Total
Queen	3	5 1/2	7 1/2	16
Worker	3	6	12	21
Drone	3	6 1/2	14	24

THE QUEEN BEE

There is a considerable difference in appearance between a queen and a worker bee. Workers and queens develop from the same type of egg; however, the differences are brought about in the development of the larva. Any larva that would have otherwise grown into a worker can produce a queen, provided the larva is young enough (1 to 2 days old) and is fed royal jelly throughout its larval period. The queen cell is much larger than other cells and hangs down from its attachment to the comb. When the virgin queen is about a week old, she flys out and mates with 5 to 8 drones. Two days after mating, the queen begins to lay eggs. After egg laying begins, the queen never mates again. Early and late in the season the queen may lay only a few hundred eggs per day, but at the height of the spring season she may lay 1,500 to 2,000 eggs per day. When a queen

begins to lay drone eggs she should be replaced at once or the colony united with a normal colony.

THE WORKER BEE

The worker bees, which are females, are the ones that do all of the work in a colony except that of laying fertile eggs. They feed the young larva until they are sealed within the cells, feed the queen her special food, perform house-cleaning duties, secrete wax and build honeycomb, gather propalis, water, pollen and nectar, guard the entrance of the hive, and perform any other needed work. Workers present in the hive during the active season have a short life, estimated at 4 to 6 weeks. Those reared in the fall usually live through the winter and spring, possbily for 5 to 6 months. If the queen in the colony dies and for some reason the colony does not rear a queen, one or more workers begin to lay eggs. Such bees are called "laying workers." The presence of several eggs scattered about within a cell is a fairly certain signal that laying workers are in the colony. Those workers do not mate with drones so the eggs are unfertilized and produce only drones. A colony of bees containing laying workers is not worth requeening; it should be united with a strong colony which contains a good queen. Then, several weeks later that colony can be divided and a laying queen given to a queenless colony.

THE DRONE BEES

The drone, or male bee, is much larger than a worker. His abdomen is round, thick and blunt and without a stinger. The only useful purpose of drones is to mate with virgin queens. A good beekeeper trys to keep the drones in a colony down to a very small number. This is done by sorting out and melting combs that contain a large number of drone cells.

LEARNING ACTIVITIES

1. Show and explain slides on the subject.

2. Bring to class one or more of each caste of bees to aid with identification.

OBJECTIVE 5. Given a list of seasonal bee management practices, the student will be able to match the proper season with the management practice, with at least 75% accuracy.

SUBJECT MATTER CONTENT

Certain chores must be done each year during the periods of fall, winter, and spring. It is best for the beginning beekeeper to start with bees in March or April. However, preparations should begin the previous fall.

FALL PERIOD (SEPTEMBER AND OCTOBER)

The honey flow is likely to be finished by October 1 in North Louisiana and by October 25 in South Louisiana. So that each colony will have plenty of stores for winter and spring, 40 to 60 pounds of honey should be in each colony. This is the equivalent of 8 to 13 full combs. If the amount of stores is not up to the required standard, you must feed sugar syrup. A colony of bees uses only what it requires and does not waste honey.

The fall is the best time to introduce a young laying queen into a colony so it will build up fast for the following spring. If the colony is in the proper condition in the fall, it is almost certain to be in fine shape for the following spring. It is important that each colony have a young, vigorous queen, plenty of bees and honey, and room for brood rearing during the fall period. Queenless or weak colonies should be united with a strong colony.

WINTER PERIOD (NOVEMBER THROUGH FEBRUARY)

The main requirements of bees during this time are plenty of honey, sufficient workers, and protection from cold winds and predators. Reduce the hive entrance sizes in early November to protect the colony from cold winds and mice.

Queens that stopped laying late in the fall will begin in January or February. Those that continued laying during the winter months increase egg laying in the spring. This is the time to check the hive for honey. If there is none, the colony should be fed sugar syrup.

SPRING PERIOD (MARCH THROUGH JUNE)

When plenty of pollen and honey are present with a young vigorous queen, a colony will build up rapidly and more room must be provided for brood rearing and nectar storage. The queen may be laying 1,500 to 2,000 eggs per day. She will need from 12 to 18 combs just for brood. Examine colonies early in the season on a warm, sunny day, checking for a laying queen and adequate stores. At this time, clean the bottom boards of burr comb and any

accumulated trash. If bees are seen hanging out at the hive entrance on warm days, more room is needed at once. An additional super provides room for incoming nectar and gives room into which the bees can move, thus preventing swarming. It is very important that additional supers of drawn combs or foundation be given at the beginning of, or just before, the honey flow.

During favorable years at a good location, a colony will store from 75 to 200 pounds of honey in April, May, and the early part of June. Since a colony needs considerable space for ripening nectar before it is ready to be capped, a new super of empty combs or foundation may need to be added before the combs already on the hive are full. The main needs of a colony in the spring are: a vigorous queen, plenty of room for brood rearing and nectar storage, and enough honey and pollen. In a normal season, new light-colored honey should be taken from the hive before dark; thin summer honey is mixed with it. This is usually done about June 1.

SUMMER PERIOD (JULY AND AUGUST)

Examine the colony at 3- or 4-week intervals to learn what is needed. In areas where peppervine, vervain, or eardrop vine furnish nectar, gains in weight may continue. Normal colonies probably will have reduced brood rearing so the number of field bees will be reduced. Sometimes peppervine honey ferments in the combs during wet weather. This honey should be left in the hive for 2 or 3 months or for winter feed. Requeen weak colonies or unite them with strong colonies; otherwise wax worms are likely to ruin the combs. Replace 1 or 2 year old queens with young ones. In some parts of the state, colonies may use from 10 to 20 pounds of stored honey because there is practically no nectar to be found. Pollen may also be scarce at this time of year.

LEARNING ACTIVITIES

1. Show a slide set and discuss the seasonal needs of bees with students.

2. Have an experienced beekeeper speak to your class.

OBJECTIVE 6. Given a list of steps used in the introduction of a new queen bee to a colony, students will be able to place the steps in proper order with at least 75% accuracy.

Having a good producing young queen in a colony is important to the ensuring of a good crop of honey. When introducing a new queen it is very important that there is not a laying or live queen in the colony. Find the old queen and destroy any queen cells. Before introducing the queen cage into the hive, release the attendant bees. Do this inside a room so the queen cannot fly away. Then remove the cardboard covering the candy at the end of the cage. Place the cage with the young queen between the top bars of two combs of brood. Examine the colony about 3 days later to see if the queen is laying. If there are no eggs in the brood cells, send for another queen immediately or unite the colony with another one.

LEARNING ACTIVITIES

1. Secure a young caged queen with attendant bees to show to class.

2. Discuss procedures with class, using slides.

OBJECTIVE 7. Given a written exam, students will be able to explain the method used for swarm prevention of honey bees with at least 75% accuracy.

In the spring when the colony increases in numbers, the combs are filled with brood, nectar, honey, and pollen and crowding occurs. This will cause queen cells to be started as the bees prepare to swarm. When the first queen cells are sealed, the swarm will leave the hive. The main swarming period is between mid-March and mid-April. A swarm consists of drones, field bees, young hive bees, and the old queen.

The colony likely to swarm is usually a strong one in two brood chambers, with plenty of honey for spring. To prevent a colony from swarming, just before or soon after the honey flow begins, open the hive and place the combs of sealed or mostly sealed brood into one hive body. Place the queen, unsealed brood and pollen combs in what is now the bottom brood chamber. Place a super of empty combs or combs plus some frames of foundation on top of the bottom chamber, and place the hive body containing the sealed brood over this super. A queen excluder can be placed over the bottom brood chamber for a week or two, but it must be removed for the bees may not carry much nectar through it to the super above. The brood in the top super will gradually emerge, leaving room for nectar and honey storage. When the

top super is fairly well filled and the second one is partly full, place another super of empty combs plus a few frames of foundation under the second super if the flow seems likely to continue.

Swarm prevention is accomplished by giving the bees room at the proper time so the young bees can move up out of the brood nest and relieve congestion. Examine the colonies every 10 days or 2 weeks during the spring season to determine what needs to be done. Eight or 9 days after the brood has been put into the top super, examine the combs and remove all queen cells that may have been started.

LEARNING ACTIVITIES

1. Have a practicing beekeeper speak to your class on the subject.

2. Use slides and discussion to explain the process.

3. Have equipment without bees to show how more room can be made correctly for expanding colonies.

OBJECTIVE 8. Given a written exam, students will be able to explain the proper methods used for feeding a colony of bees with at least 75% accuracy.

SUBJECT MATTER CONTENT

Beekeepers will have occurrences where the feeding of bees is needed. This can be done by replacing empty combs with combs of honey. However, this method can spread disease among colonies.

A more common method for feeding bees is the use of sugar syrup. Mix a thick sugar syrup by using 2 parts sugar to 1 part water.

A feeder can be made from a 1/2 or 1 gallon can that has a tight fitting cover. Make 10 small holes in the cover to allow the workers to get to the syrup. Place the can of feed, tightly covered, bottom up over the frames or over the hole in the inner cover. Then put an empty hive body and the cover on the hive to cover the feeder and prevent robber bees from getting to the feed. In warm weather the pail of feed will be emptied in a day or two and the pail can be refilled if necessary. Start feeding late in the afternoon to reduce the chances of robbing.

LEARNING ACTIVITIES

1. Demonstrate and have students practice the making of a feeder and the mixing of sugar syrup.

2. Demonstrate and explain how the feeder should be placed in the hive using a hive that does not contain bees.

OBJECTIVE 9. Given a list of steps to be followed in uniting two colonies of bees, students will be able to place the steps in proper order with at least 75% accuracy.

SUBJECT MATTER CONTENT

The following steps should be followed when uniting two bee colonies during honey flow:

a. Remove the weak or queenless colony from its bottom board.
b. Remove the cover of the strong colony.
c. Place the weak colony upon the strong colony.

If there is no honey flow, two thicknesses of newspaper should be placed between the strong and weak colonies when they are placed together. Cut two or three small slits in the paper to make it easier for the bees to start tearing out and removing the paper. This will allow both colonies to have the same odor and slowly unite without fighting. Find the weak queen and kill her before colonies are united.

LEARNING ACTIVITIES

1. Demonstrate proper techniques of uniting two colonies using hives without bees.

2. Show slides to and lead a discussion with students on the topic.

3. Have a guest speaker on the topic.

OBJECTIVE 10. Given a list of possible procedures for honey removal and care, students will be able to select the proper procedures with at least 75% accuracy.

SUBJECT MATTER CONTENT

Honey is not ready to be taken from the hive until 2/3 or more of the cells on the comb are capped. This would be about the end of May in South Louisiana or about June 15 in North Louisiana. Honey that is not capped may ferment after it has been extracted.

Steps to be followed in honey removal:

a. Shake or brush honey combs free of bees.
b. Place the comb in any empty super or other type of box and carry it to a closed room.
c. Uncap the combs with an uncapping knife that has been heated with hot water.
d. Place the comb in the extractor.
e. Turn the extractor very slowly at first so the weight of the honey will not tear the comb.
f. After extraction, place the empty combs back on the hives.

If possible, allow the honey to remain in the container for two or three days before bottling it. This will allow air bubbles and small pieces of wax to rise to the top. Care should be taken to keep honey that has been removed from the hive in a dry, cool (50 degrees F) place in a closed container, as honey will absorb moisture from the air, becoming thinner in body and more apt to ferment.

To kill yeast that are present and delay fermentation, heat liquid honey at 140 degrees F for 22 minutes. This will also prevent granulation.

LEARNING ACTIVITIES

1. Demonstrate proper procedures for honey removal and care.

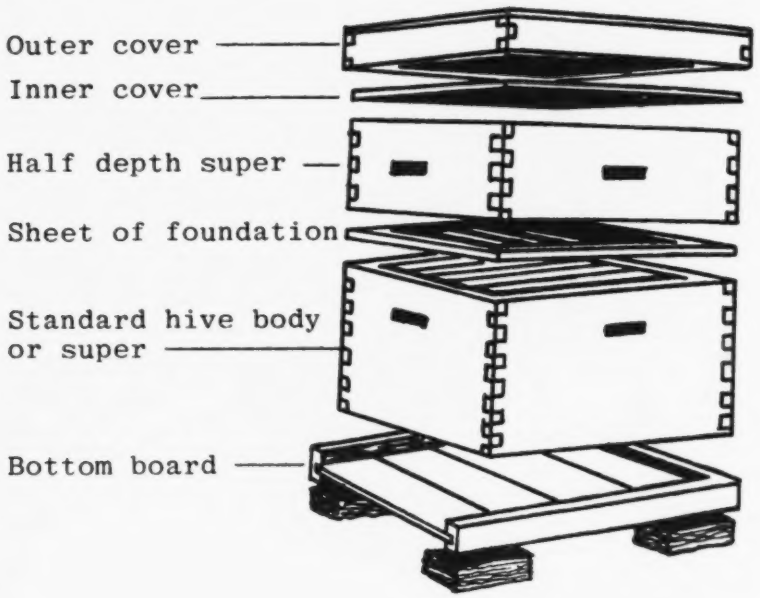
2. Provide opportunities for students to practice their skills in honey removal and care.

3. Arrange for a field trip to see the procedures of honey removal.

*Information from "Beginning with Bees", Louisiana Cooperative Extension Service

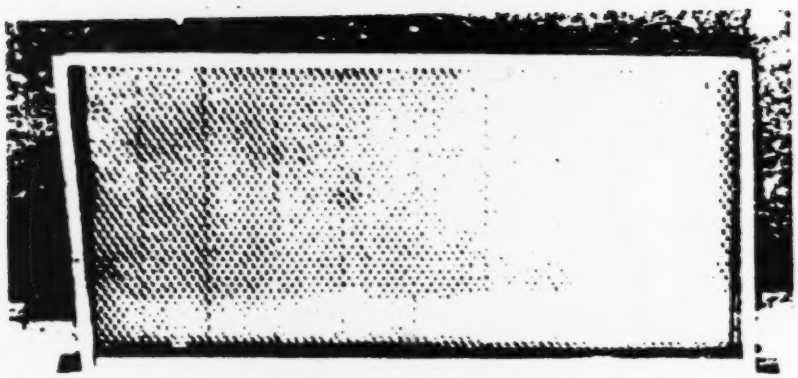
APPENDICES

Appendix A



Parts of a movable frame hive.

Appendix B



A frame with wire foundation.

UNIT III TEST

1. What size does a swarm of bees need to establish a working colony?

2. How is the health quality of established colonies that are sold assured?

3. List six parts needed for a hive.

4. List six pieces of equipment needed to work bees.

5. Check the procedures that are proper when working a bee hive:

a. ___ wear bright-colored clothes

b. ___ wear thick socks with trouser legs pulled over them

c. ___ wear canvas gloves or rubber kitchen gloves

d. ___ use a well-burning smoker

e. ___ wear a black cloth or wire screen bee veil

f. ___ if stung pull the stinger out

6. Check the proper reasons for examining a colony of bees:

a. ___ solid brood pattern

b. ___ number of queen bees present

c. ___ amount of brood and honey present

d. ___ work needed in the near future

7. Match the correct bee caste with the characteristics and/or functions listed:

___ a. male bee

___ b. lays up to 2,000 eggs per day

___ c. gather pollen and nectar

___ d. no stinger

___ e. its cell hangs down from comb

___ f. secrete wax

I. Queen Bee

II. Worker Bee

III. Drone Bee

8. Match the correct bee season with the listed management practices:

___ a. reduce hive entrance

___ b. clean bottom boards

___ c. best time to introduce a young laying queen

___ d. colony builds rapidly

I. Fall

II. Winter

III. Spring

IV. Summer

9. Rank the following steps used in the introduction of a new queen bee into a colony in the proper order:

____ release attendant bees

____ examine colony to see if queen is laying

____ find old queen and destroy any queen cells

____ place young queen between two combs of brood

10. What is the general method used to prevent swarming of honey bees?

11. How is a feeder made for use in feeding bees?

12. Rank the following steps used in uniting two colonies of bees in proper order.

____ remove the cover of the strong colony

____ find and kill the queen of the weak colony

____ place the weak colony upon the strong colony

____ remove the weak colony from its bottom board

13. From the list of possible honey removal and care procedures, check the correct procedures:

____ a. Honey is ready to be taken when two-thirds or more of the cells in a comb are capped.

____ b. Turn extractor very fast at first to shake out honey.

____ c. Allow honey to remain in containers for 2 or 3 days before bottling.

____ d. Heat honey at 140 degrees F for 22 minutes to delay fermentation.

UNIT III TEST
ANSWER KEY

1. The size of a basketball.

2. Inspection by the State Entomologist.

3. a. a bottom board
   b. inner cover
   c. outer cover
   d. 2 standard 10-frame hive bodies (supers)
   e. 10 sheets of foundation for each body
   f. 10 frames for each body

4. a. bee veil
   b. bee smoker
   c. hive tool
   d. bee brush
   e. comb uncapping knife
   f. two-frame honey extractor

5. c
   d
   e

6. a
   c
   d

7. a III
   b I
   c II
   d III
   e I
   f II

8. a III
   b II
   c I
   d III

9. 2
   4
   1
   3

10. Expanding of the hive body.

11. Use a 1/2 or 1 gallon can with a tight fitting lid. Place ten small holes in the lid.

12. 3
1
4
2

13. a
c
d

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class participation
*Students demonstrating skills on school bee equipment or an individual's farm
*Unit test

EQUIPMENT AND SUPPLIES

Student

Reference Material
Notebook

Teacher

Books
Reference Materials
Slide sets
Filmstrip with cassettes
Bulletin Board Supplies
Transparencies
Overhead Projector
Slide Projector
Filmstrip projector with cassette player
Beekeeping equipment
Honey bees
Bee hives
Bee feeding equipment
Honey removal equipment

Bulletin Board Ideas

Prepare bulletin boards using brochures and pamphlets listed in the Supplementary Materials section of this lesson.

Possible bulletin board topics:

1. Equipment used
2. Caste of bees
3. Honey products

SUPPLEMENTARY MATERIALS

Slides

10 slide sets covering life cycles, social habits, seasonal activities, production techniques and equipment of beekeeping. Nasco Agricultural Sciences Catalog, 901 Janesville Avenue, Fort Atkinson, Wisconsin, 53538

Filmstrips with Cassettes

The Business of Bees Vocational Education Productions, California Polytechnic State University, San Luis Obispo, CA 93407.

Books

ABC and XYZ of Bee Culture A.1 Rost Company, Medina, OH 44256

The Hive and the Honeybee Dodont and Sonns, Hamilton, IL 62341

Journals

"American Bee Journal." Hamilton, IL 62341

"Gleanings in Bee Culture." Medina, OH 44256

"The Speedy Bee." Box G-27, Jesup, GA 31545

UNIT IV
RAISING EARTHWORMS AND CRICKETS

INTRODUCTION

One of the most popular leisure time activities is fishing. The most common types of bait used to fish are earthworms and crickets. With very little time and initial expense boys and girls can bring in additional income by producing earthworms and crickets for fishing bait.

The purpose of this unit is to provide training in the basic techniques needed to raise earthworms and crickets successfully.

COMPETENCIES

To raise earthworms and crickets as an additional source of income.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon completion of this unit, students should be able to:

1. Identify parts of crickets and earthworms.

2. Identify environmental factors which affect the growth of crickets and earthworms.

3. Determine what equipment is needed to raise earthworms and crickets.

4. Identify reasons for producing earthworms and crickets.

SPECIFIC PERFORMANCE OBJECTIVES AND MASTERY CRITERIA

1. Given a list of parts, students will be able to identify or give meaning to the parts with at least 75% accuracy.

2. Given a list of steps to follow in raising earthworms and crickets, students will be able to complete the list with at least 75% accuracy.

3. Given a list of environmental factors which affect the growth of worms and crickets, students will be able to complete the list with at least 75% accuracy.

4. Given materials, students will construct equipment needed to raise earthworms and crickets to the satisfaction of the instructor.

5. Given a list of steps to follow in the life cycle of earthworms and crickets, students will be able to complete steps with 75% accuracy.

METHODOLOGY

A combination of methods can be used to teach this unit. The instructor may incorporate field trips to a bait shop or commercial bait grower, resource persons, or an independent study to broaden the students' knowledge of raising worms and crickets. Lecture and class discussion can also be used to bring out problems and procedures.

SUGGESTED INTEREST APPROACHES

1. Plan a fishing trip and use crickets and worms for bait.

2. Plan a field trip to a local bait shop.

3. Discuss with class the potential income of producing crickets and worms.

UNIT OUTLINE

I. Parts of Cricket and Worms

  A. Earthworm

    1. Anterior

    2. Posterior

    3. Mouth

    4. Seminal receptacle opening

    5. Female opening

    6. Male opening

    7. Setae

    8. Clitellum

9. Dorsal pores

10. Anus

B. Cricket

1. Head

2. Thorax

3. Abdomen

4. Antenna

5. Simple eye

6. Compound eye

7. Mandible

8. Labium

9. Femur

10. Tibia

11. Tarus

12. Mouth

13. Maxilla

14. Labium

15. Claws

16. Ear

17. Spiracles

18. Ovipositor

19. Cercus

20. Hind wing

21. Front wing

II. Life Cycle

A. Cricket

B. Earthworms

III. Production and Environmental Controls

A. Temperature

B. Moisture

C. Aeration

D. Beds

E. Feeds and Feeding

F. Harvesting

IV. Equipment

V. Grading and Counting

VI. Packaging and Storage

VII. Selling

VIII. Pests and Diseases

SPECIFIC PERFORMANCE OBJECTIVES AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a list of parts, students will be able to identify or give meaning to at least 75% of the parts of worms and crickets.

SUBJECT MATTER CONTENT

A. Parts of earthworm

1. anterior
2. posterior
3. mouth
4. seminal opening
5. female opening
6. male opening
7. setae
8. clitellum
9. dorsal pores
10. anus

B. Parts of cricket

1. head
2. thorax
3. abdomen
4. antenna
5. simple eye
6. compound eye
7. mandible
8. labium
9. femur
10. tibia
11. tarus
12. mouth
13. labium
14. maxilla
15. claws
16. ear
17. spiracles
18. ovipositor
19. cercus
20. hind wing
21. front wing

LEARNING ACTIVITIES

1. Prepare a list of parts and their functions.

2. Draw a picture of an earthworm and a cricket, and also label the parts.

3. Discuss parts and functions with class.

4. Pass out sheet with a picture of an earthworm and cricket and have students label them.

OBJECTIVE 2. Given a list of steps to follow in raising earthworms and crickets, students will be able to complete the list with at least 75% accuracy.

SUBJECT MATTER CONTENT

1. Steps to follow:

    1. Equipment needed for raising earthworms and crickets

    2. Types of waterers used

3. Feeds and feeding

4. Egg laying pans

5. Graders and counters

LEARNING ACTIVITIES

1. Prepare a list of Do's to follow in raising earthworms and crickets.

2. Prepare a list of Don'ts to follow in raising earthworms and crickets.

3. Discuss with class steps to follow in raising earthworms and crickets.

OBJECTIVE 3. Given a list of environmental factors affecting the growth and reproduction of worms and crickets, students will be able to complete list with 75% accuracy.

SUBJECT MATTER CONTENT

1. Environmental factors that affect worms and crickets.

   a. temperature
   b. moisture
   c. aeration
   d. pH--acidity-alkalinity

LEARNING ACTIVITIES

1. Discuss with class how environmental factors affect worms and crickets.

2. Describe major environmental factors that affect worms and crickets.

OBJECTIVE 4. Given materials, students will construct equipment needed to raise earthworms and crickets to the satisfaction of the instructor.

SUBJECT MATTER CONTENT

1. Materials list:

   a. 5 gal. cans
   b. wire screen
   c. animal manure
   d. garden compost

LEARNING ACTIVITIES

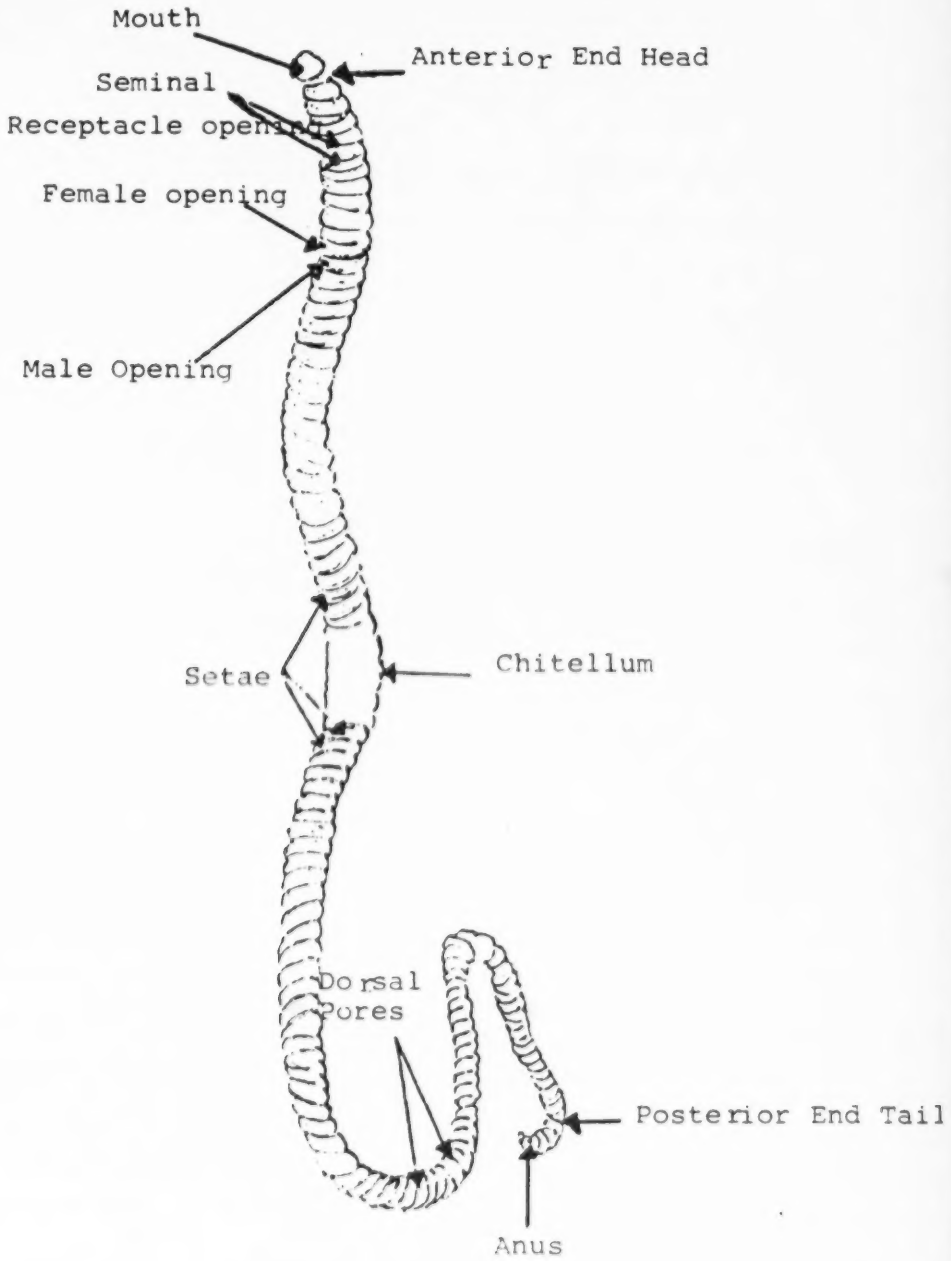
1. Construct brooder for crickets.

2. Construct earthworm bed.

APPENDICES

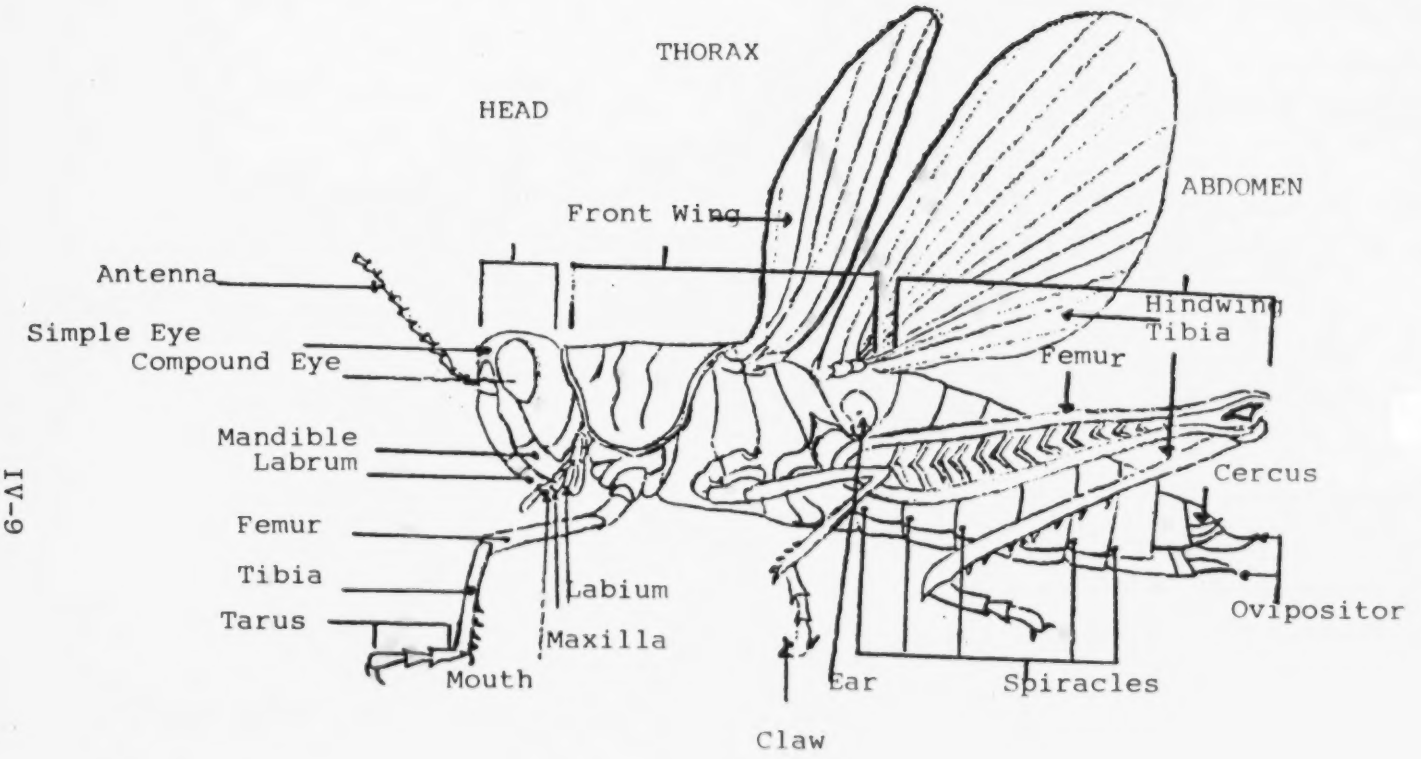
APPENDIX A

Parts of the Earthworm



APPENDIX B

Parts of the Cricket



UNIT IV TEST

1. List 4 factors which affect the growth of earthworms and crickets.

   a.

   b.

   c.

   d.

2. What types of feed is needed to raise;

   a. earthworms

   b. crickets

3. What materials are needed to raise;

   a. earthworms

   b. crickets

4. What is the most common use for earthworms and crickets?

5. Where are earthworms and crickets sold?

6. List two reasons for producing earthworms and crickets.

   a.

   b.

Earthworm

MATCH THE PARTS

_____ Dorsal Pores

_____ C L Tellum

_____ Posterior End

_____ Anus

_____ Setae

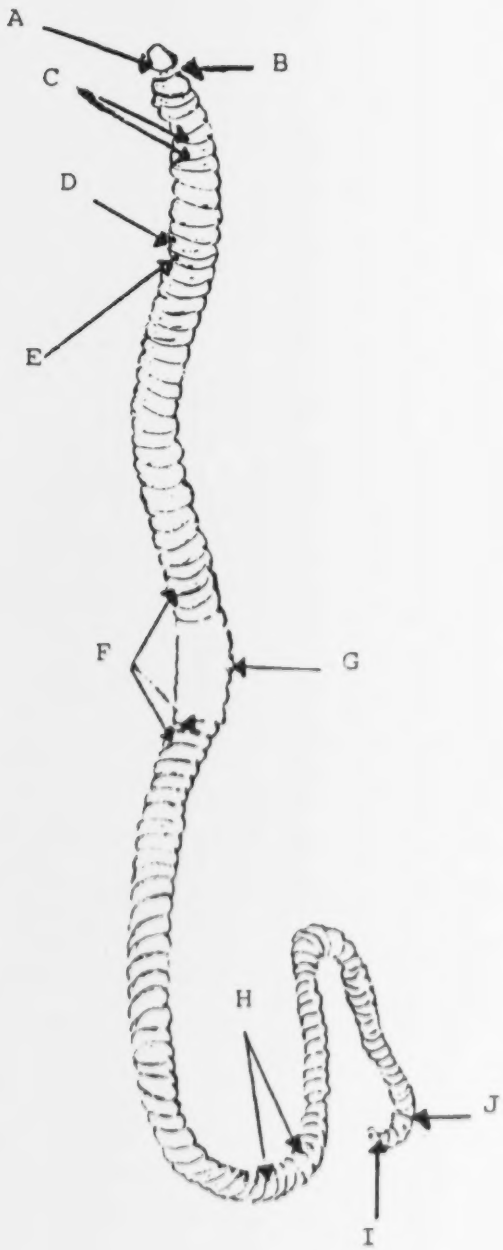
_____ Male Opening

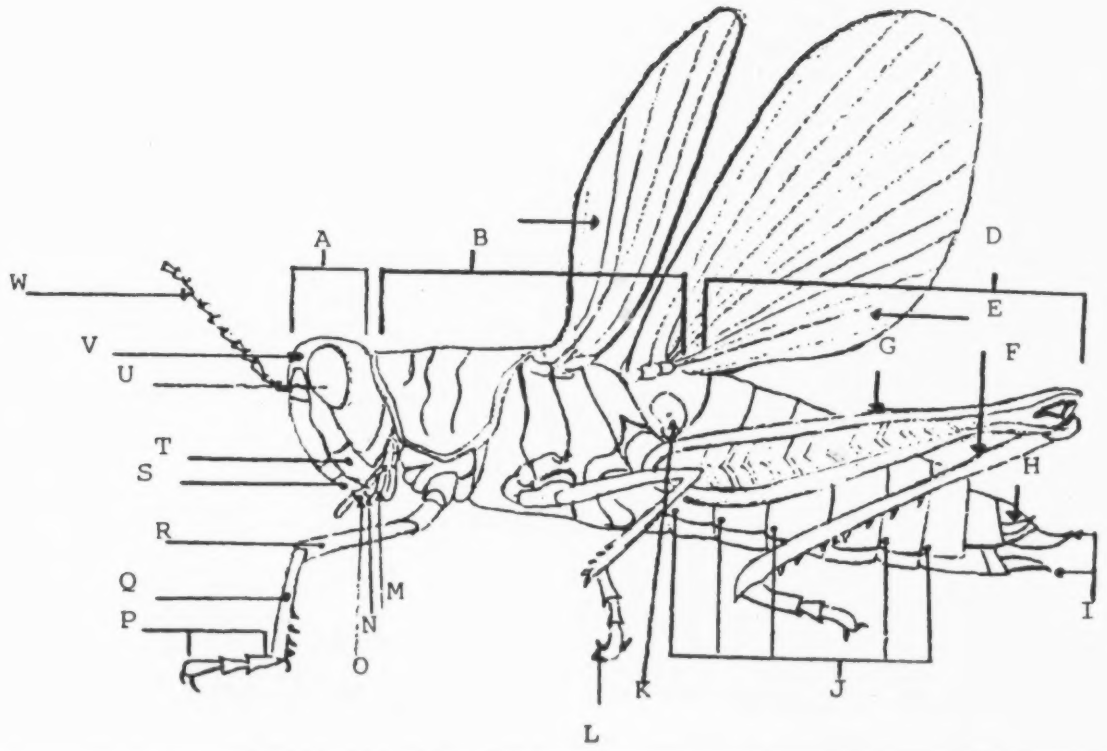
_____ Female Opening

_____ Mouth

_____ Antenior End

_____ Seminal Recptale Openings





MATCH THE PARTS

_____ Maxilla	_____ Abdomen	_____ Compound eye	_____ Head
_____ Ear	_____ Cercus	_____ Femur	_____ Labium
_____ Claws	_____ Antenna	_____ Hindwing	_____ Tarus
_____ Spiracles	_____ Tibia	_____ Thorax	_____ Femur
_____ Ovipositor	_____ Mandible	_____ Front Wing	_____ Labrum
	_____ Simple Eye	_____ Labium	_____
		_____ Mouth	

UNIT IV TEST
ANSWER KEY

1. a. temperature

   b. moisture

   c. aeration

   d. pH--acidity-alkalinity

2. a. earthworms - compost, manure

   b. crickets - chicken starter mash or cornmeal

3. a. earthworms - moist compost and soil

   b. crickets - 5 gallon container or box, screen, waterers

4. Fishing bait

5. Bait shops

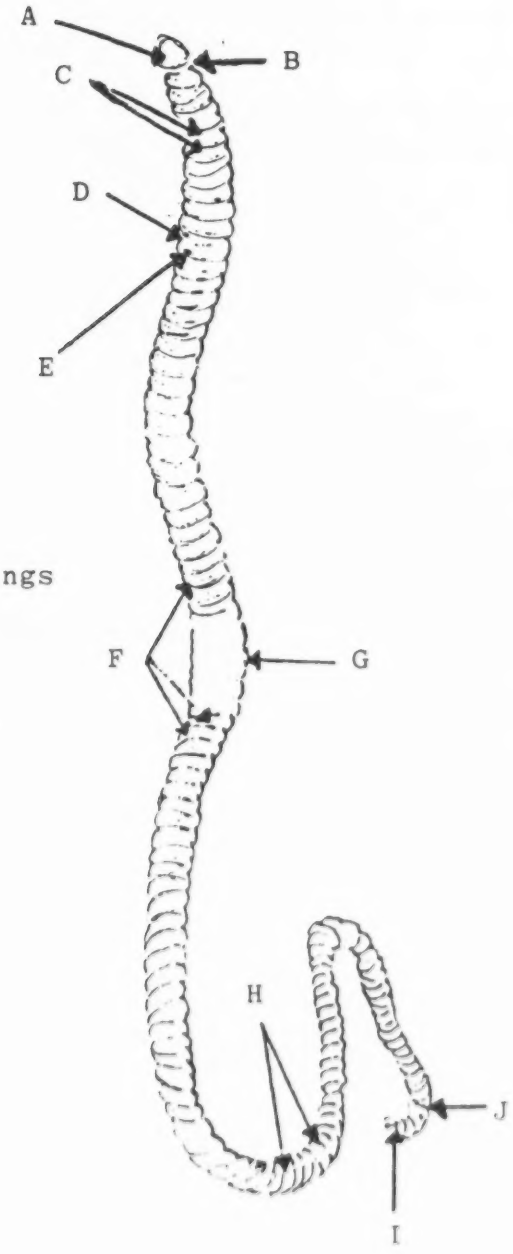
6. a. extra income

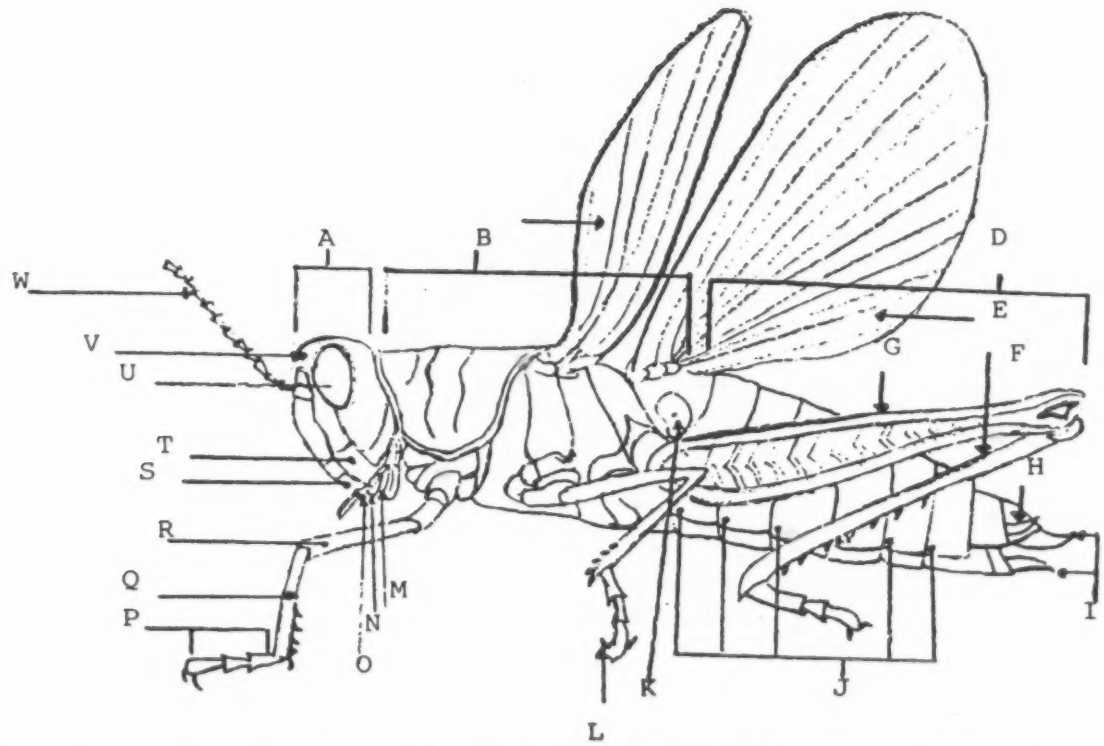
   b. fishing bait

Earthworm
Answer Key

MATCH THE PARTS

H	Dorsal Pores
G	C L Tellum
J	Posterior End
N	Anus
F	Setae
E	Male Opening
D	Female Opening
A	Mouth
B	Antenior End
C	Seminal Receptacle Openings





MATCH THE PARTS

N	Maxilla	D	Abdomen	U	Compound eye	A	Head
K	Ear	H	Cercus	G	Femur	M	Labium
L	Claws	W	Antenna	E	Hindwing	P	Tarus
J	Spiracles	F	Tibia	B	Thorax	G	Femur
I	Ovipositor	T	Mandible	W	Front Wing	S	Labrum
		V	Simple Eye	M	Labium		
				O	Mouth		

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class participation

*Students' demonstrating skills on school campus or at an individual's home

*Unit test

EQUIPMENT AND SUPPLIES

Student

Reference material
Notebook

Teacher

Reference material
Pamphlets
Overhead projector
Transparencies
5 gal. cans
wire screen
animal manure
garden compost

SUPPLEMENTARY MATERIALS

Earthworm Biology and Production, LSU Cooperative Extension Service

Bureau of Sport Fisheries and Wildlife. 1970. Earthworms for Bait. U. S. Fish and Wildlife Service

Raising Crickets for Bait, LSU Cooperative Extension Service

UNIT V
RAISING RABBITS

INTRODUCTION

Rabbits are produced for meat, fur, and biological research purposes. Most domestic rabbits are raised for meat production. Americans eat 25 to 30 million pounds of domestic rabbit meat each year. This meat production comes from backyard rabbitries as well as large commerical rabbitries. Rabbit production offers the opportunity for a producer to start with a small operation and grow into a large commercial operation, or to maintain a small production unit for family meat production. Rabbit production can also be very educational for the new or young producer, as it includes most all of the production and management areas of other livestock production.

The purpose of this unit is to provide training relative to proper selection, feeding, and management of rabbits.

COMPETENCIES

To properly select, feed, house, manage, and care for rabbits.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon completion of this unit, students should be able to:

1. Identify the breeds of rabbits and explain the characteristics of each breed.
2. Select a good rabbit for breeding stock.
3. Select proper housing, feeding, and watering equipment as well as other equipment needed to properly produce rabbits.
4. Formulate a proper feed ration for rabbits.
5. List proper management procedures to be used in the breeding and reproduction of rabbits.
6. Select the proper procedures used in caring for and management of young rabbits.
7. Develop a record keeping system.

8. Select the correct procedures for disease control and injury prevention.

9. List ways in which rabbits can be marketed.

SPECIFIC PERFORMANCE OBJECTIVES AND MASTERY CRITERIA

1. Given a list of rabbit breed characteristics, students will be able to identify the breed or breeds that possess each characteristic with at least 75% accuracy.

2. Given a list of rabbit characteristics, students will be able to select those characteristics that are essential to selecting good rabbit breeding stock with at least 75% accuracy.

3. Given a rabbit production situation, students will be able to select proper housing, feeding and watering equipment, and other equipment needed to properly match the situation with at least 75% accuracy.

4. Given a rabbit production situation, students will be able to formulate a proper feed ration for the rabbits with at least 75% accuracy.

5. Given a written exam, students will be able to list proper management procedures to be used in the breeding and reproduction of rabbits with at least 75% accuracy.

6. Given a multiple choice exam, students will be able to select the proper procedures used in caring for and managing young rabbits with at least 75% accuracy.

7. Given a rabbit production situation, students will be able to develop a record keeping system with at least 75% accuracy.

8. Given a list of rabbit production procedures, students will be able to select the procedures that are correct for proper disease control and injury prevention with at least 75% accuracy.

9. Given a test, students will be able to list ways in which rabbits can be marketed with at least 75% accuracy.

METHODOLOGY

This unit should be taught using a combination of methods. The instruction may include taking rabbits and rabbit production equipment to the vocational agriculture facilities for demonstrations, field trips to rabbitries,

resource persons, and independent study along with lecture and class discussion.

SUGGESTED INTEREST APPROACHES

1. Plan a field trip to a rabbitry so that students can see firsthand proper production techniques in use.

2. Secure rabbits and production equipment that can be transported to the vocational agriculture facilities to demonstrate and/or point out selection procedures, breed characteristics, breeding procedures, and other production and management skills.

3. Show a film and/or filmstrips on rabbit production.

4. Point out and direct a discussion with students on the advantages of home rabbit production.

5. Conduct a cookout using rabbit meat to demonstrate the quality of rabbit meat products.

6. Prepare a bulletin board, using brochures and pamphlets, on the topic of rabbit production.

UNIT OUTLINE

RAISING RABBITS

I. Breeds of Rabbits and Their Characteristics

- A. Californian
- B. Champagne D'Argent
- C. English Spot
- D. Flemish Giant
- E. New Zealand

II. Selection of Breeding Stock

III. Selecting Equipment and Housing for Rabbit Production

IV. Feed of Rabbits

V. Breeding and Reproduction of Rabbits

VI. Care and Management of Young Rabbits

VII. Record Keeping Systems

VIII. Disease Control and Injury Prevention

IX. Marketing of Rabbits

SPECIFIC PERFORMANCE OBJECTIVE AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a list of rabbit breed characteristics, students will be able to identify the breed or breeds that possess each characteristic with at least 75% accuracy.

SUBJECT MATTER CONTENT

Rabbits best suited in size and conformation for meat and fur production are the medium and large breeds. White skins generally bring the highest prices and may need to be considered when selecting a breed if you have a good market for skins. If you plan to raise rabbits for laboratory purposes, find a market before production begins and raise a breed suited to the laboratories' needs.

Since meat production is the major reason rabbits are produced commercially, the breeds discussed will be those that are suited to meat production.

A. Californian - a mature body weight of 8 to 10 1/2 pounds; white body color with dark or black colored nose, ears, feet, and tail.

B. Champagne D'Argent - a mature body weight of 9 to 12 pounds; under fur dark slate blue, surface fur blue white or silver with a liberal sprinkling of long black guard hairs.

C. English Spot - mature weight 9 to 12 pounds; white body with black, blue, chocolate, tortoise, lilac, gray or steel-gray spots. Head spots appear on nose, ears, cheeks, and as circles around the eyes; spine spots extend from the base of the ears to the middle of the hindquarters.

D. Flemish Giant - mature weight 13 pounds or more; body colors may be black, blue, fawn, light gray, sandy steel gray, or white.

E. New Zealand - mature weight 9 to 12 pounds; body colors may be black, red, or white.

LEARNING ACTIVITIES

1. Show and discuss slides of each of the breeds of rabbits.

2. Prepare a classroom display of materials about breeds of rabbits for student observation and study.

3. Take a field trip or take rabbits to the site of instruction for the purpose of pointing out breed characteristics.

OBJECTIVE 2. Given a list of rabbit characteristics, students will be able to select those characteristics that are essential to selecting good rabbit breeding stock with at least 75% accuracy.

SUBJECT MATTER CONTENT

Areas that should be considered in selection of breeding stock are health, vigor, longevity, ability to reproduce, and desirable type and conformation.

When starting in the rabbit business, select young animals to become acquainted with the rabbits and their habits before they reach breeding age. Begin production on a small scale and after having gained experience, if desired, expand the rabbitry.

A list of rabbit breeders can be obtained from local, state, and national breeders' organizations. Deal directly with reliable breeders who will stand behind the stock they offer. Do not buy stock from sources where the parentage and production practices are not known.

Use the breed standards provided in the Standard of Perfection published by the American Rabbit Breeders' Association, for selection of breeding stock. The characteristics and selection procedures for each breed are provided. Experienced rabbit producers may also provide valuable assistance in the selection of breeding stock.

LEARNING ACTIVITIES

1. Take a field trip to a rabbitry to do selection instruction and examine characteristics important to selection.

2. Take one or more rabbits to the vocational agriculture facilities to do selection instruction.

3. Use a picture or overhead transparency of a rabbit to point out areas to be examined for proper selection.

OBJECTIVE 3. Given a rabbit production situation, students will be able to select proper housing, feeding, and watering equipment, as well as other equipment needed to properly match the situation with at least 75% accuracy.

SUBJECT MATTER CONTENT

When planning a rabbitry, review literature on the subject, visit several established breeders, and discuss building and equipment needs with the breeders. During the planning process remember to consider local building regulations, climatic conditions, the size of your planned operation, and the amount of money to be invested.

Hutches can be placed outdoors in the shade of trees or buildings. Also, a light superstructure may be used to provide shade. Sunlight in a rabbitry can help maintain sanitary conditions, but rabbits should have a choice between sunlight and shade at all times.

During hot weather additional cooling is generally needed. Overhead sprinklers or foggers can be placed in buildings to help with cooling. If breeding is attempted during very hot weather, additional cooling, such as placing containers of ice in the hutch, or air conditioning may be needed. Make sure the buildings used are well ventilated and receive the benefit of prevailing breezes.

Individual hutches should be provided for mature rabbits. Hutches should be about 2 feet high and 2 feet deep. Make the hutches 3 feet long for small breeds, 4 feet for medium breeds, and 6 feet for large breeds. Hutches may be made of all wire for use inside buildings or semi-enclosed for outdoor use.

Wire mesh flooring is used in commercial rabbitries, allowing for self-cleaning. Wire mesh is often used in small rabbitries; however, a solid wood floor or a combination wood and wire mesh can be used with regular cleaning. The wire mesh used should have a wire spacing of 1/2 inch by 1 inch.

A good nest box should be used to provide seclusion for the doe when she gives birth to her litter as well as

protection for the litter. It should be simple to clean and maintain, provide good drainage and ventilation, and be accessible to the young when they are large enough to leave and return to the nest. The nest box should be 15 inches long, 11 inches tall with a 6 inch front lip to keep the young in while they are young but allow them to leave and return as they get older. A bedding of wood shavings and hay should be used in the nest box.

Use feed crocks, troughs, hoppers and hay mangers that are large enough to hold several feedings. Use a type that will prevent waste and contamination of feed.

You can purchase crocks especially designed for rabbit feeding. These crocks are heavy enough so they won't be tipped, and they have lips that prevent the rabbits from scratching out feed. Crocks can be used for feeding pellets or whole grain.

When hay or green feed is included in the ration, hay mangers should be incorporated into the hutches. Space can be saved by having one manger serve two hutches. Hay waste can be reduced by placing troughs under the mangers. These troughs can also be used to feed supplemental grains.

Hoppers save considerable time and labor when they are designed for self-feeding. Use them for feeding pregnant does, does with suckling litters, and rabbits being conditioned for market. Hoppers can be made from cans, wood, or other suitable material.

Rabbits need clean, fresh water at all times. During warm weather, a doe and her litter will drink about 1 gallon of water per day.

Crocks or large cans are suitable watering devices for small rabbitries. Automatic watering systems provide a steady supply of clean, fresh water. They are used extensively in commercial rabbitries to reduce labor, but they are generally not practical for use in most small rabbitries.

LEARNING ACTIVITIES

1. Discuss housing and equipment needs of rabbits with your class.

2. Point out housing and equipment used in rabbitries during a field trip.

3. Take rabbit production equipment to your vocational agriculture facilities for a discussion with students.

4. Have students draw a plan for a rabbitry including feeding and watering equipment.

OBJECTIVE 4. Given a rabbit production situation, students will be able to formulate a proper feed ration for the rabbits with at least 75% accuracy.

SUBJECT MATTER CONTENT

Feed is one of the most important and most expensive components of rabbit production. Feeding must be designed to meet the needs of the herd and the type of production of the rabbitry.

Hay can be fed to supply the bulk, or fiber, required for a balanced rabbit ration. High-quality hay can also provide much of the protein needed by rabbits.

Any type of high quality legume or grass hay can be fed to rabbits. Fine-stemmed, leafy, well-cured hay can be fed whole. Coarse hay should be chopped into 3- to 4-inch lengths to reduce waste and make the hay more convenient for feeding.

Most grains including oats, wheat, barley, sorghum grain, and corn can be fed whole or in milled form. To prevent waste, feed flinty varieties of corn in meal form. Since grains are similar in food value, they can substitute for each other without materially altering the nutritive value of the ration.

Soybean, peanut, and linseed meals are rich in protein and can be used as protein supplements to balance rabbit rations. Protein meal should be mixed with whole grains because much of the meal will settle out and be wasted. If whole grains are fed, supply the protein in flake, cake, or pelleted form.

The salt requirement can be supplied by putting small salt blocks or spools in the hutches so the rabbits can feed at will.

Many brands of pelleted feed are available on the market. Pellets require little storage space and are easily fed. Pellets are generally a good method of feeding a small number of rabbits because they reduce the number of feeds that must be purchased. There are two general types of pelleted rabbit feed. All grain pellets are to be fed with hay, while some pellets are a complete feed.

Pelleted rabbit feed should be bite-size. Pellets should be no larger than 3/16 inch in diameter and 1/4 inch long. If pellets are larger, small rabbits will bite off part of a pellet and waste the rest. The ingredients of pelleted feeds will vary. Follow the advice of the manufacturer when pellets are used in the ration.

Fresh green feeds and root crops can be used in the ration when they fit into the management program. These feeds should be used sparingly with rabbits that are unaccustomed to them. Do not use feed that is spoiled or contaminated.

Junior does and bucks, mature dry does, and herd bucks not in service but in good physical condition can be maintained on hay alone if fine-stemmed, leafy, legume hay is fed. If coarse legume hay or grass hay is fed, give each 8 pound animal 2 ounces of all-grain protein mixture daily. Adjust the amount of concentrate in the ration for rabbits of other weights. Feed herd bucks in service the same amount of concentrate and give them free access to choice quality hay.

Alfalfa pellets may be full-fed to developing junior does and bucks as the only feed from the time they are weaned until they are ready for breeding. Purchase pellets containing 1 percent salt and 99 percent of No. 2 leafy or better grade alfalfa meal (15 percent protein).

To feed a doe properly, it is necessary to know definitely whether she has conceived. Palpating 14 days after breeding is a quick and accurate method of determining pregnancy.

After the mating, maintain the doe in breeding condition on good quality hay. If the doe fails to conceive as determined by palpation 14 days after breeding, breed her again and keep her on a maintenance ration until she is diagnosed as pregnant.

When the doe is diagnosed as pregnant, give her all the concentrates she will eat in addition to good-quality hay. All grain pellets or a grain-protein mixture can be fed with the hay, or you can feed a complete pelleted ration and no hay.

Gradually change over to the new ration. Sudden changes in rations fed during the gestation period may cause some does to go "off feed."

After the doe kindles, feed her in the same manner as during pregnancy. Keep her on the high-concentrate ration until the young are weaned. Provide additional feed as the litter develops.

LEARNING ACTIVITIES

1. Discuss with the class why the nutrient needs of the rabbit change with the stages of production.

2. Take a field trip to a rabbitry to observe and discuss the proper feeding of rabbits.

3. Show a filmstrip on the proper feeding of rabbits.

OBJECTIVE 5. Given a written exam, students will be able to list proper management procedures to be used in the breeding and reproduction of rabbits with at least 75% accuracy.

SUBJECT MATTER CONTENT

The gestation period of rabbits is 31 or 32 days. Some litters may be kindled as early as the twenty-ninth day or as late as the thirty-fifth day, but 98 percent of the normal litters will be kindled between the thirtieth and thirty-third day.

The proper age of bucks and does for the first mating depends on the breed and individual development. Small breeds develop more rapidly and are sexually mature at a younger age than medium and large breeds. Some individual rabbits within a breed will develop more rapidly than others. Generally, the small breeds can be mated when the bucks and does are 4 to 5 months old, the medium breeds at 5 to 6 months, and the large breeds at 9 to 12 months. Mate does when they reach maturity. If mating is delayed too long, breeding difficulties may occur. Does that are maintained in good physical condition should produce litters until they are 2 1/2 to 3 years old.

If rabbits are being raised for show purposes, it may be advisable not to raise more than two or three litters per year. Arrange matings so the offspring will be of proper age and development for show classifications.

For meat and fur production you can work breeding animals throughout the year. With a gestation period of 31 or 32 days and a nursing period of 6 to 8 weeks, a doe can produce four litters in a 12-month period. Does of heavy producing strains can be mated 35 days after kindling if they are in good condition. If a litter is lost at kindling

and the doe is in good condition, she can be rebred earlier than called for by the regular schedule.

A doe shows signs of being ready for mating by restlessness and nervousness, by rubbing her chin on feeding and watering equipment, and by attempting to join other rabbits in nearby hutches. It is not necessary to depend on external signs to determine when a doe is to be bred. Set up a definite schedule and follow it, whether the does show signs of being ready for service or not.

Always take the doe to the buck's hutch for service. Mating should occur almost immediately when you place the doe in the buck's hutch. When the mating is completed, return the doe to her own hutch. Make a record of the date of mating and the name or number of the buck and doe. Attempt mating does each day until mating is successful.

Try to maintain one buck for each 10 breeding does. Mature, vigorous bucks can be used several times a day for a short period.

An accurate method of determining pregnancy is important in managing the breeding herd. Test mating (placing the doe in the buck's hutch periodically) is not accurate because some does will accept service when pregnant and others will refuse service when not pregnant. Diagnosing pregnancy by the development of the abdominal region and the gain in flesh is not dependable until late in the pregnancy period.

Pregnancy can be quickly and accurately determined by palpating the doe 12 to 14 days after mating. To restrain a doe for palpating, hold the ears and the fold of skin over the shoulders in the right hand; place the left hand between the hind legs, slightly in front of the pelvis; place the thumb on the right side and the fingers on the left side of the abdomen; exert light pressure and move the fingers and thumb gently backward and forward. If the doe is pregnant, you should be able to distinguish the embryos as marble-shaped forms as they slip between the thumb and fingers. Handle the doe gently and use only light pressure on the abdominal cavity.

Does diagnosed as pregnant should be placed on a pregnancy ration. Nonpregnant does should be rebred and kept on a maintenance ration until they are diagnosed as pregnant.

Accurate determination of pregnancy by palpation takes practice. If you are inexperienced, repalpate does diagnosed as nonpregnant a week later. If a mistake has been made in the first palpation, the doe can be put on a pregnancy ration and provided with a nest box at the proper

kindling time. With practice, you may develop enough skill to diagnose pregnancy as early as the tenth or eleventh day.

LEARNING ACTIVITIES

1. Show a filmstrip on breeding of rabbits and discuss it with the class.

2. Take a field trip to a rabbitry to observe and discuss breeding of rabbits and management of breeding stock.

3. Have a resource person who is experienced with breeding and reproduction of rabbits speak to your class.

OBJECTIVE 6. Given a multiple choice exam, students will be able to select the proper procedures used in caring for and management of young rabbits with at least 75% accuracy.

Place a nest box in the hutch 27 days after the doe is mated. A day or two before kindling, the doe will start to pull fur from her body to line the nest, and she usually consumes less feed than the normal amount. Give her small quantities of green feed. This will have a beneficial effect on her digestive system.

Most litters are kindled at night. Kindling complications are rare when the doe is in good condition. After kindling, the doe may be restless. Do not disturb her until she has quieted down.

Sometimes does fail to pull fur to cover their litters, or they kindle their litters on the hutch floor. When this occurs, arrange the bedding materials to make a comfortable nest and pull enough fur from the doe's body to cover the litter. You can often save the young rabbits by warming them, even if they appear lifeless. Keep some extra fur on hand for such cases.

Inspect the litter the day after kindling. Remove any deformed, undersized, or dead young from the nest box. If you are careful and quiet when inspecting the litter, the doe generally will not object. If the doe is nervous and irritable, place some tempting feed in the hutch to distract her attention.

You can transfer baby rabbits from a large litter to a foster mother that has a small litter. For meat and fur production, 7 to 9 per litter is desirable. Adjusting the number of young to the capacity of the doe will promote more

uniform development and finish at weaning. For best results, the young rabbits should not vary more than 3 to 4 days in age when they are transferred.

The young rabbits should open their eyes 10 to 14 days after birth. The eyes of baby rabbits occasionally become infected and fail to open normally. If the infection is treated promptly, the young rabbits usually recover without any permanent eye injury. To treat the infection, bathe the inflamed and incrusted eyelids with warm water. When the tissue softens, separate the lids with a slight pressure. If pus is present on succeeding days, treat the eyes with an antibiotic eye ointment or a fresh solution containing 10 percent argyrol.

Young rabbits start coming out of the nest to eat feed when they are 19 or 20 days old. If the young come out of the nest sooner, they may not be getting enough milk or the nest may be too warm.

The doe usually nurses her young at night or in the early evening and morning hours. If the litter becomes divided, the doe will either nurse the young in the nest or those on the hutch floor. She will not nurse both groups, nor will she pick up the young and return them to the nest.

Leave the young rabbits with the doe until they are 6 to 8 weeks old. By that time, the milk supply will have decreased and the young will be accustomed to eating other feed. Fryer rabbits should be in marketing condition at about 8 weeks of age.

LEARNING ACTIVITIES

1. Take a field trip to a rabbitry to observe and discuss proper procedures used in the management of young rabbits.

2. Show a filmstrip that shows students the proper management procedures for the care of young rabbits.

3. Have a resource person come to your school and discuss the procedures used in the management of young rabbits.

OBJECTIVE 7. Given a rabbit production situation, students will be able to develop a record keeping system for the situation with at least 75% accuracy.

SUBJECT MATTER CONTENT

Mark each breeding rabbit for your record system. Tattooing is the best marketing method because it is permanent and will not disfigure the ears. Tattooing instruments can be obtained from biological and livestock supply houses. An adjustable box is convenient to restrain rabbits for tattooing (Appendix A). Ear tags and clips are not satisfactory for marking because they tear out and disfigure the ears.

A convenient and simple record system is needed to keep track of breeding, kindling, and weaning operations. Information from the records can be used to cull unproductive animals and to select desirable breeding stock. The essential features of a simple performance card, and a hutch card (Appendix B and C) can usually be obtained from feed mills or firms dealing in rabbitry supplies.

LEARNING ACTIVITIES

1. Use an overhead transparency of record keeping cards and discuss them with your class.

2. Demonstrate proper procedures for ear tattooing of rabbits.

3. Take a field trip to a rabbitry to view and discuss the record keeping systems being employed.

OBJECTIVE 8. Given a list of rabbit production procedures, students will be able to select the procedures that are correct for proper disease control and injury prevention with at least 75% accuracy.

SUBJECT MATTER CONTENT

Sanitation in the rabbitry is the best disease control method. Remove manure, soiled bedding and contaminated feed from the rabbitry daily. Wash the watering and feeding equipment frequently in hot soapy water. Rinse in clear water, drain well, and place in the sun to dry. If sun drying is impractical, rinse the equipment in a water-disinfectant solution, then rinse again in clear water.

Isolate animals suspected of being diseased. Leave suspected animals in isolation for at least 2 weeks, or until you can determine definitely whether they are

dangerous to the health of the herd. Newly acquired rabbits and those returned from shows should be placed in quarantine at least 2 weeks. Bury or burn dead animals.

Effective treatments are not known for some rabbit diseases. It is usually safer and simpler to destroy a few animals than to risk the spread of disease to the healthy stock. This is especially true of animals that have respiratory infections.

Rabbits are often injured by improper handling. Never lift rabbits by the ears or legs. The proper way to lift and carry a medium or large rabbit is as follows: grasp the fold of skin over the shoulder with the right hand and support the rabbit by placing the left hand under the rump. If the rabbit scratches or struggles, hold him snugly under the left arm.

Toenails of rabbits confined in hutches do not wear normally. The long toenails often get caught in wire mesh flooring and the rabbits injure themselves trying to get loose. You can prevent this problem by cutting the toenails periodically. Hold the rabbit's foot up to daylight and observe the cone in the toenail. Use sidecutting pliers and cut the toenail below the tip of the cone. When done correctly, this operation will not cause hemorrhaging or injury to the sensitive part of the toenail.

LEARNING ACTIVITIES

1. Demonstrate to your class the proper procedures for lifting and carrying a rabbit.

2. Demonstrate to your class the proper procedures for trimming the toenails of rabbits.

3. Take a field trip to a rabbitry to observe and discuss disease and injury prevention procedures used.

OBJECTIVE 9. Given a test, students will be able to list at least four ways in which rabbits can be marketed with at least 75% accuracy.

SUBJECT MATTER CONTENT

Some producers sell live rabbits direct to brokers. However, many small producers do their own slaughtering, packaging, and marketing.

Rabbits raised for meat and fur are usually marketed when they reach fryer weight (4 to 6 pounds). Most medium and large breeds should develop a desired weight and finish by the time they are two months of age.

In some areas there may be a good market for roasters (mature rabbits). Culls from the breeding herd can be fattened for roasters, or it may be profitable to develop young rabbits to heavier weights.

An increasing demand of rabbits for biological purposes offers marketing opportunities to breeders living near hospitals and laboratories.

LEARNING ACTIVITIES

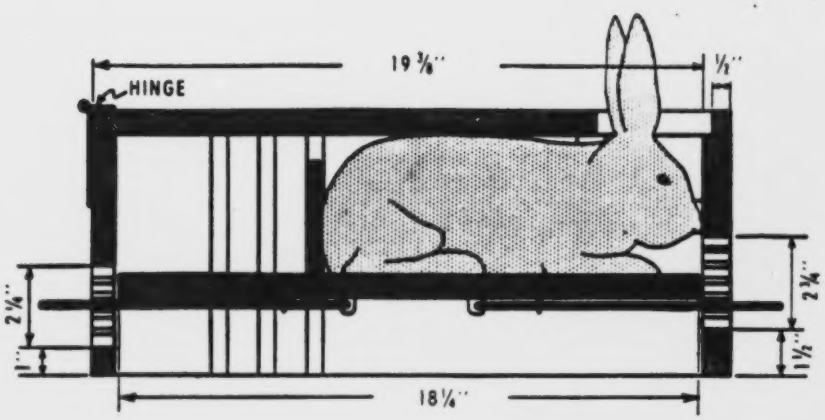
1. Lead a discussion about possible marketing opportunities in the area.

2. Have a resource person speak to your class on methods of marketing and type of markets available for rabbits.

*Information from "Raising Rabbits", Louisiana Cooperative Extension Service

APPENDICES

Appendix A



The spring-type holders tacked to the lower side of a movable floor pushes the rabbit toward the top of the box. A movable cross partition holds the rabbit toward the front.

HERD BINDER NO. _____

PEDIGREE and RECORD OF PERFORMANCE

Breed _____ **Reg. No.** _____

Color _____ **Born** _____ **Weight** _____ **Fur** _____

Ear No. _____ **Sex** _____ **Type** _____

SIRE

Name _____

Reg. or Ear No. _____

R.O.P. _____

Sire _____ Reg. No. _____ R.O.P. _____ Dam _____ Reg. No. _____ R.O.P. _____	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____
	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____

DAM

Name _____

Reg. or Ear No. _____

R.O.P. _____

Sire _____ Reg. No. _____ R.O.P. _____ Dam _____ Reg. No. _____ R.O.P. _____	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____
	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____	Sire _____ Reg. No. _____ Dam _____ Reg. No. _____

LITTER RECORD

Doe No.	Buck No.	Date Bred	Pal-Pated	Date Kindled	No. Kindled	No. Left	No. Added	No. Raised	Quality of Litter Exc.	Avg.	Poor	Weight	No. Sold	Remarks

RECORD OF PRODUCTION

	Total Lbs. or No.	Total Sales	Gross Costs	Net Profit
1st Year				
2nd Year				
3rd Year				
4th Year				
		Total Income		

The above animal was purchased by _____ **Date** _____

Signed _____

Appendix C

HUTCH RECORD CARD

BASS EQUIPMENT CO., BOX 352 MONETT, MO. 65708

Doe _____ Ear Tattoo No. _____ Breed _____ Normal Weight _____

No. Nipples _____ Born _____ Sire _____ Dam _____

BUCK	Date of Service	Pregnancy Check	Date Kindled	Number of Young		At 8 weeks		REMARKS
				Kindled	Left	No. Left	Weight	

UNIT V TEST

1. Match the following:

____ white body color with dark or black colored nose, ears, feet and tail

____ white body with black, blue, chocolate, tortoise lilac, gray or steel-gray spots

____ under fur dark slate blue, surface fur blue white or silver

____ body colors may be black red, or white

____ body colors may be black, blue, fawn, light gray, sandy steel gray or white

a. English Spot

b. Flemish Giant

c. New Zealand

d. Californian

e. Champagne D'Argent

2. Place a check beside the selection practices that should not be done or looked for in selecting rabbit breeding stock.

____ a. healthy

____ b. ability to reproduce

____ c. start with older experienced rabbits

____ d. start with a large number of rabbits to gain experience

____ e. buy the least expensive stock available regardless of source

____ f. use breed standards published in the Standard of Perfection for selection of breeding stock

3. A rabbit producer wants to raise medium sized rabbits. What sizes and types of hutches does he need?

4. A rabbit producer has high quality grass hay that he has produced. He also has very little room for storage of additional feeds, which must be purchased. What would be the best types of feed for him to use?

5. List 5 management procedures that should be considered in producing a medium sized breed of rabbits.

Multiple Choice:

6. Place a nest box in the hutch _____ days after the doe was mated. (a) 20; (b) 27; (c) 33; (d) 40

7. Most litters are kindled _____: (a) at night; (b) during the morning; (c) in the afternoon.

8. If baby rabbits' eyes are infected and do not open properly you should: (a) destroy the rabbits; (b) leave the rabbits alone; (c) bathe the eyes with warm water; (d) give the rabbits an injection of an antibiotic.

9. List steps that should be taken to keep proper records for a rabbitry.

10. Check the rabbit production procedures that are needed for proper disease control.

____ (a) remove manure daily

____ (b) wash watering and feeding equipment frequently

____ (c) leave animals returned from shows in quarantine for 2 months

____ (d) quarantine all newly purchased animals

____ (e) wash rabbits weekly

11. List four ways which rabbits can be marketed.

UNIT V TEST
ANSWER KEY

1. d
   a
   e
   c
   b

2. c
   d
   e

3. Hutch Size - 2 feet high, 2 feet deep, 4 feet long
   Hutch Floor - wire mesh flooring with a spacing of 1/2 inch by 1 inch.

4. Use the high quality grass hay that he has. Purchase all grain pellets to feed with the hay.

5. Gestation period 31 or 32 days.

   *use mature (5 to 6 month old or older) breeding stock
   *mate does when they reach maturity
   *does can be mated 35 days after kindling
   *does should provide a nursing period of 6 to 8 weeks for young rabbits
   *set up a breeding schedule and follow it even if does show no signs of being ready for service
   *maintain 1 buck for each 10 does
   *palpate does 12 to 14 days after mating
   *does determined pregnant by palpation should be placed on pregnancy ration
   *does determined not pregnant by palpation should be rebred

6. b

7. a

8. d

9. *tattoo all rabbits' ears for permanent identification
   *keep records of breeding, kindling, and weaning operations
   *use records to cull unproductive animals
   *use pedigree, record of performance, and hutch cards to keep records

10. a
    b
    d

11. *sell live rabbits direct to brokers
*sell slaughtered rabbits
*sell cull breeding stock as roasters
*develop young rabbits to heavier weights for roasters
*sell for biological purposes

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class Participation

*Students' demonstrating skills on school farm, campus or at an individual's rabbitry

*Unit Test

EQUIPMENT AND SUPPLIES

Student

Reference Material
Notebook

Teacher

Rabbits
Rabbits Production Equipment and Supplies
Reference Material
Brochures
Bulletin Board Supplies
Overhead Projector
Transparencies
Filmstrip Projector and Cassette Tape Player
Cassette Sound Film Strip
Slide Projector
Slide Set

Bulletin Board Ideas

Prepare bulletin boards using pictures from brochures listed in the Supplementary Materials section of this unit. Equipment used, production techniques, and breeds of rabbits might be included on bulletin boards.

SUPPLEMENTARY MATERIALS

Reference Books

Available through Bryant Rabbit Equipment Company and other sources.

Templeton, G.	Domestic Rabbit Production
Bennett, B.	Guide to Winning Rabbit Shows
Bennett, B.	Raising Rabbits the Modern Way
Messner, J.	Rabbit Diseases
Mannell, P.	How to Start a Commercial Rabbitry
Konable, A.	Raising Rabbits
	Rabbit Encyclopedia

Extension Services Publications

Raising Rabbits
Domestic Rabbits: Diseases and Parasites

Filmstrip with Cassette Sound

Available through Vocational Education Productions, California Polytechnic State University, San Luis Obispo, CA 93407.

Rabbits Order No. 1-470-231C

Slide Sets

Available from Vocational Instructional Services, P. O. Box 182, College Station, TX 77843.

Breeds of Rabbits Order No. 5001

Standards for Breeds of Rabbits

Standard of Perfection Available from American Rabbit Breeders' Association, Inc. P. O. Box 426, Bloomington, IL 61701.

UNIT VI
BOBWHITE QUAIL PRODUCTION

INTRODUCTION

The production of Bobwhite Quail can provide part-time or full-time income for a limited number of producers. Quail can be marketed as a meat source or for hunting purposes.

The purpose of this unit is to provide training relative to the proper selection, incubation, brooding, and rearing of Bobwhite Quail.

COMPETENCIES

To properly select, house, feed, manage, and care for Bobwhite Quail.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon completion of this unit, students should be able to:

1. Select proper procedures for selection and care of Bobwhite Quail breeding stock.
2. Select proper procedures for incubation of Bobwhite Quail.
3. Select proper procedures for feeding, brooding, and rearing of Bobwhite Quail.

SPECIFIC PERFORMANCE OBJECTIVE AND MASTERY CRITERIA

Given a multiple choice test, students will be able to select proper procedures used in the selection, care, incubation, feeding, brooding, and rearing of Bobwhite Quail with at least 75% accuracy.

METHODOLOGY

This unit should be taught using a combination of methods. The instruction may include taking quail and equipment to vocational agriculture facilities for demonstrations, a field trip to a quail production unit, resource persons, lecture, and class discussion along with the use of visual aids.

SUGGESTED INTEREST APPROACHES

1. Plan a field trip to a Bobwhite Quail production unit so that students can see, first-hand, the proper production techniques in use.

2. Secure one or more Bobwhite Quail that can be transported to vocational agriculture facilities to point out the characteristics of the bird.

3. Provide a film or filmstrip on quail production.

4. Prepare a bulletin board on game bird production.

UNIT OUTLINE

I. Selection of Breeders

II. Facilities

III. Eggs and Incubation

IV. Brooding and Rearing

V. Feeding and Watering

VI. Care and Management

VII. Marketing

SPECIFIC PERFORMANCE OBJECTIVE AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a multiple choice test, students will be able to select proper procedures used in the selection, care, incubation, feeding, brooding, and rearing of Bobwhite Quail with at least 75% accuracy.

SUBJECT MATTER CONTENT

Bobwhite Quail can be produced for meat production or for hunting purposes. The larger varieties are generally selected for meat production, while medium and small varieties are grown for hunting. The smaller varieties are generally faster and fly better and are in demand for use in hunting reserves.

Select breeding stock that has a history of good egg production, hatchability, and livability. Breeding stock should come from a disease-free source, preferably tested for and free of pullorum and typhoid. Birds or hatching eggs may be purchased for breeding stock.

Breeding stock can be kept in either cages or in floor pens. The advantages of cages is that eggs are kept cleaner and have less exposure to disease and parasites. Cages can be for an individual pair or a colony. Birds need about 0.5 square feet of space each. A solid partition between cages is needed to prevent fighting. Floor pens should provide one square foot of floor space per bird.

By providing up to 17 hours of light per day year-round, one can attain production. Bobwhite hens will begin egg production at 16 to 24 weeks of age. In a six-month breeding season, a hen will produce about 90 eggs.

Eggs should be stored at 55 degrees to 65 degrees F. and at a relative humidity of 75 to 80 percent until incubation. Proper incubation procedures are as follows:

a. Period of incubation 23 to 24 days
b. Temperature 99.75 degrees F.
c. Humidity, wet bulb 84 to 86 percent
d. Future breeders should be debeaked at hatching.

After hatching the young birds should be brooded for 5 or 6 weeks. Several different types of facilities can be used including batteries, floor pens with litter, and raised wire floors. Less space is required if batteries or raised wire floors are used. However, a floor pen with a hover or infrared brooder is the simplest method.

Mixing of feed on the farm is possible, but purchasing of commercially prepared feeds is generally more economical. A chick starter should be fed free-choice from 1 day of age to 6 weeks of age. A growing diet should be fed to birds 6 weeks of age to 16 weeks of age. Birds that will be used for hunting purposes should be fed a flight conditioner feed starting at 6 weeks of age. Birds raised for meat should be fed a finishing feed from 16 weeks of age until they reach a weight of 2.5 pounds. Clean, fresh water should be provided for birds at all times.

Quail seem to be more sensitive to mismanagement than chickens. Cannibalism is increased by crowding, bright lights, insufficient feeders and water space, too high temperatures, and placing different types of birds together. Most of the cannibalism can be controlled by proper management and debeaking. Future breeders should be debeaked at hatching.

Bobwhite Quail are susceptible to most of the diseases and parasites that affect domestic poultry. A disease prevention program similar to that of chickens should be used.

Bobwhite Quail can generally be marketed at 16 weeks of age or slightly older. At this age they can be used for meat or hunting purposes. Most producers of hunting birds condition the birds in wire pens 12 to 15 feet wide and 100 to 150 feet long for about one month before they are released. Many producers contract a year or two ahead for the sale of their birds.

LEARNING ACTIVITIES

1. Plan a field trip to a Bobwhite Quail production unit so that students can see, first-hand, the proper production techniques in use.

2. Secure one or more Bobwhite Quail that can be transported to vocational agriculture facilities, to point out the characteristics of the bird.

3. Show a sound filmstrip on quail production.

4. Prepare a bulletin board on game bird production.

5. Lead a discussion with the class on possible markets for Bobwhite Quail in the area.

UNIT VI TEST

Multiple Choice:

_____ 1. Bobwhite Quail breeding stock for meat production should be selected from _____ varieties.

a. small
b. medium
c. large
d. faster

_____ 2. Caged quail need about ____ square feet per bird.

a. 0.5
b. 1
c. 1.5
d. 2.5

_____ 3. Young birds should be brooded after hatching for a period of _____.

a. 2 weeks
b. 6 weeks
c. 2 months
d. 6 months

_____ 4. Cannibalism in quail can be caused by:

a. crowding
b. bright lights
c. high temperatures
d. insufficient feeder space
e. a and d
f. all of the above

_____ 5. The advantage to cage production of quail is:

a. cleaner eggs
b. less exposure to parasites
c. less waste of feed
d. a and b
e. all of the above

UNIT VI
ANSWER KEY

1. c
2. a
3. b
4. f
5. d

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class Participation

*Students demonstrating skills on school facilities or individual facilities

*Unit Test

EQUIPMENT AND SUPPLIES

Student

Reference Material
Notebook

Teacher

Reference Material
Bulletin Board Supplies
Filmstrip Projector and Cassette Tape Player
Cassette Sound Filmstrip

Bulletin Board Ideas

Prepare a bulletin board using pictures from wildlife magazines, extension brochures and other publications showing the opportunities for the production of different types of game birds.

SUPPLEMENTARY MATERIALS

Filmstrips with Cassette Sound

Available on the following subjects from Vocational Education Productions, California Polytechnic State University, San Luis Obispo, CA 93401.

An Introduction to Game Birds

Brooding of Game Birds

Books

Available from NASCO, Fort Atkinson, WI 53538, and other sources.

Scheid, D. Raising Game Birds

Stromberg, L. Sexing All Fowl

Stromberg, J. A Guide to Better Hatching

UNIT VII
PRODUCTION OF PHEASANTS

INTRODUCTION

The confinement raising of pheasants for both table food and hunting can be a profitable enterprise for a limited number of producers.

The purpose of this unit is to provide training relative to the proper selection, incubation, brooding, and rearing of pheasants.

COMPETENCIES

To properly select, house, feed, manage, and care for pheasants.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon completion of this unit, students should be able to:

1. Select proper procedures for selection and care of pheasant breeding stock.
2. Select proper procedures for care and incubation of pheasant eggs.
3. Select proper procedures for feeding, brooding, and raising pheasant.

SPECIFIC PERFORMANCE OBJECTIVE AND MASTERY LEVEL

1. Given a multiple choice test, students will be able to select proper procedures used in the selection, care, incubation, feeding, brooding, and rearing of pheasant with at least 75% accuracy.

METHODOLOGY

This unit should be taught using a combination of methods. The instruction may include taking pheasants and equipment to your vocational agriculture facilities for demonstrations, a field trip to a pheasant production unit, resource persons, lecture, and class discussion along with the use of visual aids.

SUGGESTED INTEREST APPROACHES

1. Plan a field trip to a pheasant production unit so that students can see, first hand, the proper production techniques.

2. Secure one or more pheasant that can be transported to vocational agriculture facilities to point out the characteristics of the bird.

3. Provide a film or filmstrip on pheasant production.

4. Prepare a bulletin board on game bird production.

UNIT OUTLINE

I. Selection of Breeders

II. Mating and Egg Production

III. Care of Eggs and Incubation

IV. Brooding

V. Bird Health

VI. Marketing

SPECIFIC PERFORMANCE OBJECTIVE AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a multiple choice test, students will be able to select proper procedures used in the selection, care, incubation, feeding, brooding, and rearing of pheasant with at least 75% accuracy.

SUBJECT MATTER CONTENT

The most common breed of pheasant raised in Louisiana is the Ringneck, and is generally considered to be the most useful, all purpose pheasant. However, the methods used to raise the Ringneck can be successfully used with other breeds.

Pheasants are protected by state game laws. If you decide to raise them, you must obtain a license from the state to sell pheasant.

Breeding stock should come from a source that is tested and shown to be pullorum free. Choose birds for their size, weight, and feathering, without visible defects. Select birds that feather rapidly in true plumage color.

In mating, one male is provided for each five or six females. Individual mating pens with only one male are more satisfactory than larger pens. However, some producers use community pens holding about 40 hens and 20 males.

Pheasants should be kept in covered pens on well-drained soil. The moveable pen usually 8 feet wide, 12 feet long, and 6 feet high is the most desirable type. These pens should be moved at least three times during the breeding season to control diseases and parasites. These pens are also suitable for winter holding pens.

If birds are held in a separate pen during the winter, they should be taken from winter holding pens and put in laying pens about 4 weeks before the mating season, which is usually about the first of March. They should be culled at this time and only the select birds kept for breeders. Cornstalks or brush should be placed in the center of the pens, with nest boxes placed under the covering so the birds can hide if animals such as cats and dogs come near.

Egg production can be increased by the use of artificial lights. Increase light to 14 to 15 hours daily and hold constant throughout the breeding season.

The number of eggs and hatchability obtained will depend largely on the quality of rations fed to the breeders. If pens are moved so that green feed is available, hatching results are likely to be more satisfactory. Any good laying and breeding mash feed with ample grain will give good results.

Some pheasants will lay 50 or more eggs in a season, but the average production is about 35 eggs. Eggs should be gathered each day. However, after the weather gets warm, it is best to gather eggs more often.

Eggs should be stored in a cool place (a temperature of 50 to 60 degrees F is desirable). Incubation should follow soon after the eggs are laid. In no case should they be held more than 3 weeks.

The incubation period for the pheasant is 23 to 24 days. Follow temperatures that are recommended by manufacturers of incubators for best hatchability.

Some producers of pheasants brood their birds in colony brooder houses. However, where only a few pheasant are grown, brooding cages and battery brooders may be more desirable. Small oil or electric house brooders or infra-red brooding lamps are satisfactory for brooding pheasant. A temperature of 95 degrees F should be maintained at the level of the chicks for the first week. The temperature is gradually reduced 5 degrees each week so that it is about 70 degrees F at the end of six weeks. Artificial heat is seldom required after this period.

Chicks should be removed from the incubator and placed under the brooder as soon as they are dried off. A good poultry-starting mash should be placed before the chicks. The nutritional requirements for young pheasants are similar to those of young turkeys. A turkey-starting mash for the first two months would be more satisfactory than a chicken-starting mash. Baby chick feeders and jar-top waterers may be used. One two-foot feeder and one waterer should be provided for each 25 to 50 chicks.

Lack of sanitation is often the cause of failure in raising pheasant. Clean feeders and waterers must be provided. If birds are brooded on litter, it should be replaced each week. Chicks must be observed carefully for nose and toe picking. Any bird that has been picked should be removed from the pen and kept isolated until the wounds are healed. In severe cases of cannibalism, the birds should be debeaked.

When pheasants are about 4 weeks old, a game bird grain may be fed in addition to the mash. A grain mixture consisting of wheat, cracked yellow corn, and milo may be used. This system of feeding should be continued until the birds are mature. Oyster shell and grit should be supplied during grain feeding.

Prevention is the best method of controlling disease outbreaks in pheasant. After a disease occurs, it is often difficult to halt before serious damage is done. Some of the most common causes of diseases are unsanitary conditions, improper feeding, and overcrowding. Pheasant are subject to the same diseases as chickens.

Pheasants are generally raised for the purpose of stocking farms reserved for hunting by sportsmen. Pheasant can usually be released at the tenth to fourteenth week of age. They should not be released until they are fully feathered and are able to care for themselves.

Pheasant is a specialty item and should be processed at about 22 weeks of age and packed in an attractive form. Birds are generally sold individually frozen and vacuum packed.

LEARNING ACTIVITIES

1. Plan a field trip to a pheasant production unit so that students can see, first-hand, the proper production techniques.

2. Secure one or more pheasants that can be transported to vocational agriculture facilities, to point out the characteristics of the bird.

3. Show a sound filmstrip on quail production.

4. Prepare a bulletin board on game bird production.

5. Lead a discussion with the class on possible markets for pheasant in the area.

UNIT VII TEST

Multiple Choice:

_____ 1. The most common breed of pheasant raised in Louisiana is the _____.

a. Chinese
b. Mongolian
c. Ringneck
d. Lady Amhersts
e. Blackneck

_____ 2. In mating one male is provided for each _____ female.

a. two
b. five
c. nine
d. twelve
e. twenty

_____ 3. Nest should be placed:

a. under covering in the center of the pen
b. under covering at one end of the pen
c. under covering along the sides of the pen
d. in the open at one end of the pen
e. all of the above are acceptable

_____ 4. To increase egg production, light should be provided _____ hours per day during the breeding season.

a. eight
b. ten
c. fourteen
d. eighteen
e. twenty-four

_____ 5. Newly hatched pheasants should be brooded at a constant temperature of _____ degrees F for the first week.

a. 70
b. 80
c. 85
d. 95
e. 105

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class participation

*Students' demonstrating skills on school facilities or individual's facilities

*Unit Test

EQUIPMENT AND SUPPLIES

Student

Reference Material
Notebook

Teacher

Reference Material
Bulletin Board Supplies
Filmstrip and cassette tape player
Cassette sound filmstrip

Bulletin Board Ideas

Prepare a bulletin board using pictures from wildlife magazines, extension brochures, and other publications showing the opportunities for the production of different types of game birds.

SUPPLEMENTARY MATERIALS

Filmstrips with Cassette Sound

Available on the following subjects from Vocational Education Productions, California Polytechnic State University, San Luis Obispo, CA 93407.

An Introduction to Game Birds

Brooding of Game Birds

Books

Available from NASCO, Fort Atkinson, WI 53538, and other sources.

Scheid, D. Raising Game Birds

Stromberg, L. Sexing All Fowl

Stromberg, J. A Guide to Better Hatching

Extension Publications

Raising Pheasant in Confinement, L.S.U. Cooperative Extension Service

UNIT VIII
DAIRY GOAT MILK PRODUCTION

INTRODUCTION

A dairy goat or two can supply a family with good, wholesome milk for much less money than it takes to keep a cow. Goats cost less to start with and need less space, pasture, and feed. This can account for large savings to a family with the possibility of developing milk sales that will add to family income.

The purpose of this unit is to provide training relative to proper selection, feeding, and management of dairy goats.

COMPETENCIES

To properly select, feed, house, manage and care for dairy goats.

GENERAL PERFORMANCE OBJECTIVES/GOALS

Upon completion of this unit, students should be able to:

1. Identify characteristics of the dairy goat that should be examined during selection and purchasing.
2. Identify characteristics of the most common breeds of the dairy goat.
3. Determine the nutritional needs for a dairy goat at different stages of production.
4. Determine housing and fencing needs of the dairy goat.
5. List proper management procedures to be used in milking a dairy goat.
6. List proper management procedures to be used in the breeding and reproduction of the dairy goat.
7. List proper health management procedures to be used in producing the dairy goat.

SPECIFIC PERFORMANCE OBJECTIVES AND MASTERY CRITERIA

1. Given a list of dairy goat characteristics, students will be able to identify the ones that are important to proper selection and purchasing of dairy goats with at least 75% accuracy.

2. Given a list of dairy goat breed characteristics, students will be able to identify the breed or breeds that possess each characteristic with at least 75% accuracy.

3. Given an example of a dairy goat in a specified stage of production, students will be able to determine the nutritional needs of the animal with at least 75% accuracy.

4. Given situations in class, students will be able to determine the housing and fencing needs of a dairy goat with at least 75% accuracy.

5. Given a written exam, students will be able to list proper management procedures to be used in milking a dairy goat with at least 75% accuracy.

6. Given a written exam, students will be able to list proper management procedures used in the breeding and reproduction of the dairy goat with at least 75% accuracy.

7. Given a written exam, students will be able to list proper health management procedures to be used in dairy goat production with at least 75% accuracy.

METHODOLOGY

This unit can be taught by using a combination of methods. The instruction may include taking dairy goats and dairy goat products to the vocational agriculture building for demonstration, taking field trips to dairy goat production units, using resource persons, and combining independent study with lecture and class discussion.

SUGGESTED APPROACHES

1. Provide samples of goat milk and other goat milk products that can be tasted by the students in the class to demonstrate the quality of dairy goat products.

2. Plan a field trip to a dairy goat production unit so that students can observe the use of proper production techniques.

3. Secure one or more dairy goats to transport to the vocational agriculture building to demonstrate and/or point

out selection procedures, breed characteristics, milking procedures, and other production and management skills.

4. Provide a film or filmstrip on dairy goat production.

5. Point out and direct a discussion with students on the advantages of the dairy goat over dairy cattle for home production.

6. Prepare a bulletin board from brochures and pamphlets on dairy goat production.

UNIT OUTLINE

I. Dairy Goat Characteristics Important to Selection and Purchasing

- A. Disease Concerns
- B. Reliable Breeder
- C. Clean Facilities
- D. Doe Milking Behavior
- E. Quality of Milk
- F. Production Records
- G. Teeth
- H. Coat and Skin
- I. Udder
- J. Fat Cover
- K. Hoofs
- L. Jaw
- M. Ears

II. Breeds of Dairy Goats

- A. Nubian
- B. American La Moncha
- C. Saanen

D. French Alpine

E. Toggenbury

III. Nutritional Needs

A. Pasture

B. Feeding

IV. Housing and Fencing Needs

V. Milking

VI. Breeding and Reproduction

VII. Health Management

A. Diseases

B. Parasites

SPECIFIC PERFORMANCE OBJECTIVES AND LEARNING ACTIVITIES

OBJECTIVE 1. Given a list of dairy goat characteristics, students will be able to identify those that are important to proper selection and purchasing of the dairy goat with at least 75% accuracy.

UNIT CONTENT

A good doe (female goat) produces two or more quarts of milk a day for about ten months of the year. Two goats may be better than one because a yearly supply of milk is possible, and they will be company for each other.

For home milk production a grade goat (not purebred) may be used. They are generally less expensive than a purebred animal. Points to be considered when selecting a doe are the following:

a. Buy from a herd in which there is no brucellosis or tuberculosis. Find out when the herd was last tested for these diseases.

b. Buy only from a reliable breeder.

c. Make sure that the quarters and pens in which the goat is housed are clean.

d. Milk the does you are selecting to find out how they handle.

e. Drink some of the milk from the does you are selecting to determine quality.

f. Examine each doe's production records.

g. Look at the doe's teeth. If they are badly worn, she is too old to be a good milk producer.

h. Examine the coat and skin. A healthy, well fed goat has a glossy coat and a skin free of sores and dandruff.

i. Feel the udder after the doe has been milked. Make sure the udder and the teats are sound and do not have hard places, warts, sores, or scars.

j. Avoid a fat doe. She is probably a poor milk producer.

k. Look at the doe's hoofs. Make her walk around the lot. A goat with untrimmed hoofs or foot rot will limp and probably will not thrive.

l. Feel under jaw; avoid a doe with lumps, knots, or growths.

m. Check the ears for sores, scars, or scabs.

LEARNING ACTIVITIES

1. Take a field trip to a dairy goat production unit to do selection and to examine characteristics.

2. Take one or more dairy goats to the vocational agriculture building to do selection procedures.

3. Use a picture or overhead transparency of a dairy goat to point out areas to be examined for proper selection (Appendix A).

4. Prepare a list of selection procedures to be given to students.

OBJECTIVE 2. Given a list of dairy goats breed characteristics, students will be able to identify the breed or breeds that possess each characteristic with at least 75% accuracy.

UNIT CONTENT

The differences between families and individuals in each goat breed appear to be greater than differences between breeds; however, some breed differences do exist. Selection of a breed may be important as you will generally do better with animals that appeal to you personally.

The breeds most common in the United States are as follows:

A. The Nubian is relatively large and has a proud and graceful appearance. Distinguishing features are long, wide, pendulous ears and the convex Roman nose. A Nubian may be any color or colors, solids, or patterned. Common colors include black, gray, cream, white, shades of tan, brown and rich reddish brown. Common markings include lighter ears, facial stripes, muzzle, crown, and/or undertrim. Overall light or dark colored spots or patches of any size are often found. The Nubian rarely gives as much milk as other major breeds, though her milk averages higher butterfat.

B. The American La Moncha may be any color but is distinguished by its external ears which are either absent or very short. The different type of ears are known as "gopher" and "cookie." Their hair is short, fine, and glossy, and their faces are straight. Any color or combination of colors is acceptable.

C. The Saanen is medium to large with a rugged bone structure and plenty of vigor. They have erect ears, straight or dished faces, and an alert and graceful carriage giving them a deerlike appearance. They may be white or cream in color, and the cream may vary in shades from light to dark fawn. White is, however, preferred to cream. Spots on the skin are not discriminated against, but colored spots in hair are not desirable. The hair should be short and fine although a fringe over the spine and thighs is often present.

D. The French Alpine is a large, rangy, yet deerlike animal, characterized by an endless variety of color and pattern as follows: Cow Blanc (white neck); Cow Clair (tan neck); or Cow Noir (black neck). The body and hindquarters of the first two of these are usually black or dark in color with the reverse being the case in the third. They are also found in other colors, such as white, pied, cinnamon, strawberry, and various shades of red.

E. The Toggenbury is of medium size, sturdy, and vigorous. The hair is short or medium in length and is soft, fine, and lies flat. The color is solid varying from light fawn to dark chocolate with distinct white markings;

white ears with dark spots in the middle; two white stripes down the face from the eyes to muzzle; hind legs white from the knees downward; a white triangle on either side of the tail, and a white spot in the area of the wattles. Varying degrees of cream markings in place of white are acceptable.

LEARNING ACTIVITIES

1. Show and discuss slides or pictures of each of the breeds of dairy goats to point out breed characteristics.

2. Prepare a classroom display of materials about breeds of dairy goats for students observation and study.

3. Take a field trip or take goats to the site of instruction for the purpose of pointing out breed characteristics.

OBJECTIVE 3. Given an example of a dairy goat in a specified stage of production, students will be able to determine the nutritional needs of the animal with at least 75% accuracy.

UNIT CONTENT

A. Pasture for dairy goats:

Goats are browsers and will eat coarse weeds and woody plants. If you allow goats to roam the woods, be sure there are no wild cherry, hemlock, azaleas, or species of the laurel family where they graze because these plants are poisonous.

Does enjoy browsing, but they cannot be expected to produce milk without hay or pasture plus grain. Goats thrive on any good mixed pasture, but do not like clover by itself. Sudangrass or millet can provide good pasture for goats. Rye, barley, or wheat make good temporary pasture for fall, winter, and early spring.

A goat generally needs about one half of an acre of pasture, but this will vary depending upon rainfall and soil types.

B. Feeding dairy goats:

Goats do well on many kinds of feeds. Their needs depend on the kind and amount of pasture available to them and if they are fresh, pregnant, or dry.

Root crops are good feed for does when available. They especially like beets, turnips, cabbages, and carrots.

A fresh or pregnant doe on good pasture should be fed 1 to 1 1/2 quarts of concentrate daily.

The concentrate is made by mixing:

oats	2 bushels
wheat bran	1 bushel (packed)
soybean or linseed meal	1/5 bushel (6 1/2 quarts)

It will last a fresh doe on pasture about 90 days and a fresh doe not on pasture 50 to 60 days.

If you have oats or oats and corn, you can feed these grains instead of concentrate. Feed 2 quarts of oats or one quart of oats and one-half quart of corn daily.

Fresh does not on pasture should have good quality alfalfa, clover or early cut mixed hay if possible. It contains needed proteins, vitamins, and minerals.

A fresh doe not on pasture should be fed a daily ration of:

hay	2 to 3 pounds
root crops	1 1/2 pounds
concentrate	1 1/2 to 2 quarts

Feeding of 2 quarts of oats or 1 quart of oats and 1 quart of corn may be used in the place of the concentrate mixture.

Dry does that are not pregnant do not need concentrate or grain. They can get along on hay and root crops. Keep iodized or black salt before your goat at all times. Additional minerals may be needed if hay quality is low. Supply plenty of clean, fresh water. Keep the water container clean. Rinse it daily.

LEARNING ACTIVITIES

1. Discuss with class why the nutrient needs of the dairy goat change with the stages of production.

2. Have students assist with the mixing of a concentrate mixture for dairy goats.

3. Take a field trip to a dairy goat production unit to observe the feeding of the goats.

OBJECTIVE 4. Given situations in class, students will be able to determine the housing and fencing needs of dairy goats with at least 75% accuracy.

UNIT CONTENT

Goats do not need any special kind of housing. Any well-built barn or shed that is dry and free from drafts will do. A stall and manger can be built at low cost.

Straw, leaves, sawdust, wood shavings or rice hulls make good bedding for goats, and usually cost very little. Goats, however, can get along without bedding if none is available.

Keep the goat shelter clean. Remove manure and spread it on fields or garden.

Persons who keep a buck (male goat) must house him at least 50 feet away from the milking does because the male odor will be absorbed in the milk and give it an undesirable taste.

Do not let goats near surfaces that are painted with lead-based paints. They may eat the paint and be poisoned.

Goats are natural climbers. They will climb on low buildings and machinery unless they are tethered or enclosed in a tight fence.

To tether a goat, you need an iron stake with a light chain attached to it. Place the stake securely in the ground and fasten the other end of the chain to a leather strap around the goat's neck.

Tethering is a good practice if you do not have fences that will hold a goat and you do not want to put them up. You can milk the doe in the morning and then tether her in a pasture. Check her occasionally to make sure she does not get entangled in the chain. Move her several times during the day. See that there is clean fresh water within her reach. In the evening, take the doe in, milk and feed her, and put her in the shelter.

A satisfactory fence for goats can be made with 48 to 54 inch woven wire fencing. Fasten the gate securely. Goats can open most gates.

In addition, you may need to protect desirable young trees and shrubs; goats will destroy them.

LEARNING ACTIVITIES

1. Discuss housing and fencing needs of goats with class (Appendix B).

2. Point out fencing and housing used in a dairy goat production unit during a field trip.

3. Properly tether a dairy goat at your school.

4. Have students draw a plan for a dairy goat production unit including housing and fencing.

OBJECTIVE 5. Given a written exam, students will be able to list proper management procedures to be used in milking of dairy goats with at least 75% accuracy.

UNIT CONTENT

Make sure that the entire milking area and all utensils used in milking are kept clean.

Before milking, wash the udder or wipe it thoroughly with a damp cloth. Each time you milk, discard the first few streams from each teat because the opening in the teats may be filled with foreign matter.

Because a doe is small, she is more conveniently milked from a stand. Such a stand is simply a bench, about chair height, with stanchion and feedbox at the front, a seat for the milker on one side, and a railing along the other side. Slatted, inclined steps lead up at the rear (Appendix B).

Young does often object to being milked at first. The stanchion helps manage them. Eating grain in the box attached to the stanchion quiets them. They soon get used to being milked and will jump on the stand without assistance.

Dairy goats produce best on a regular schedule of feeding and milking. Heavy producing does may need to be

milked three times a day for a short time after freshening, but twice a day milking is usually enough.

Be gentle with does. Whenever possible, the same person should milk a doe at the same time and place every day.

As soon as the milk is drawn, it should be strained and cooled. A small filter type strainer should be used for straining the milk. A satisfactory strainer and disposable filter disks can be bought at a hardware or dairy supply store. Avoid a strainer that has a fine brass screen.

Cool the milk to a temperature of 40 degrees F as soon as possible. This can be done by placing the milk pail or can in a tank containing cold water. The milk will cool faster if the water is flowing through the tank. Store cooled milk in the refrigerator.

Wash out all milk pans and pails in cold water right after you use them. As soon as you can, wash the utensils in hot water and detergent and scrub with a brush. Rinse with hot water, then scald them with boiling water. Store clean utensils in a dust-free place.

Goat's milk is usually pure white. It stays sweet as long as cow's milk. It can be used in the same way as cow's milk.

LEARNING ACTIVITIES

1. Have students observe milking procedures at a dairy goat production unit during a field trip.

2. Have students milk a dairy goat and process the milk at school.

3. Discuss with class the differences in dairy goat and dairy cattle milking procedures.

OBJECTIVE 6. Given a written exam, students will be able to list proper management procedures to be used in the breeding and reproduction of dairy goats with at least 75% accuracy.

UNIT CONTENT

Goats are in their prime at 4 to 6 years of age, but good ones can be kept a few years longer. Young does are usually bred when they weigh 85 to 90 pounds. Does should be in peak condition at the time they are bred.

Does come into heat regularly, about every 21 days, between September and January. After this time, they usually cannot be bred again until late in August. When a doe is in heat she is restless and constantly shakes her tail. Heat usually lasts 1 or 2 days. It does not pay to keep a buck for one or two does. In most cases it will be less expensive to have your doe bred. Breed your doe to the best buck you can afford. Try to find a buck that has produced daughters with good milking records. Artificial insemination is available in some areas.

Does give birth about 149 days (or 5 months) after they are bred. They usually give birth to two kids, but occasionally a doe may have three or four at a kidding.

A few days before you expect a doe to kid, put her in a small pen where she can be alone. See that she has plenty of clean, dry bedding and fresh water. You can easily set up a temporary pen by enclosing a small area with portable panels.

A doe usually has no trouble at kidding time. However, if she strains strongly and does not deliver within an hour, call a person who has had experience with kidding or with lambing. If such a person is not available, call a veterinarian. Afterbirth should be expelled within an hour after kidding.

Make certain that the newborn kids do not chill. Dry them with a clean dry cloth and place them near the doe where she can lick them.

When kids are two or three hours old, they are usually ready to nurse. If kids do not get up and nurse, milk some colostrum (first milk) from the doe and give it to the kids at once. Colostrum contains vitamins and antibodies that protect the kids from infection.

Let the kids nurse for three or four days and then train them to drink from a pan, or start hand feeding from a nippled bottle and change to a pan later on. Kids will start eating a little hay and grain at an early age.

If your family needs the milk and your feed supply is limited, you may want to sell kids soon after birth. Buck kids generally are sold for meat when they are two to four months of age. The flesh of kids has a flavor similar to

lamb. Doe kids from high producing does are often worth keeping for milk production or for sale later on as dairy animals.

LEARNING ACTIVITIES

1. Show a filmstrip with lambing management in sheep and discuss its likeness to goat kidding.

2. Have a resource person who is experienced with breeding and reproduction in dairy goats speak to your class.

OBJECTIVE 7. Given a written exam, students will be able to list proper health management procedures to be used in dairy goat production with at least 75% accuracy.

UNIT CONTENT

Goats generally are hardy and do not have as many diseases as some animals. Cleanliness is important in preventing disease and parasites. The major disorders of goats are mastitis, enteratoxemia, plant poisoning, and pneumonia. Regular tests for brucellosis and tuberculosis are advised.

Protect all goats from winter cold and dampness. Take special care in protecting young stock. Pneumonia often follows chilling and exposure and is probably the chief cause of death among kids during the winter months.

Unless properly managed, goats may have foot rot. Careful and regular trimming of hoofs and keeping pens dry helps to control foot rot.

Goats may also become infested with parasites. Care must be taken when selecting a control for parasites as most have a time after treatment when these animals should not be milked for human consumption.

LEARNING ACTIVITIES

1. Have a resource person speak to your class explaining the health program used in his dairy goats.

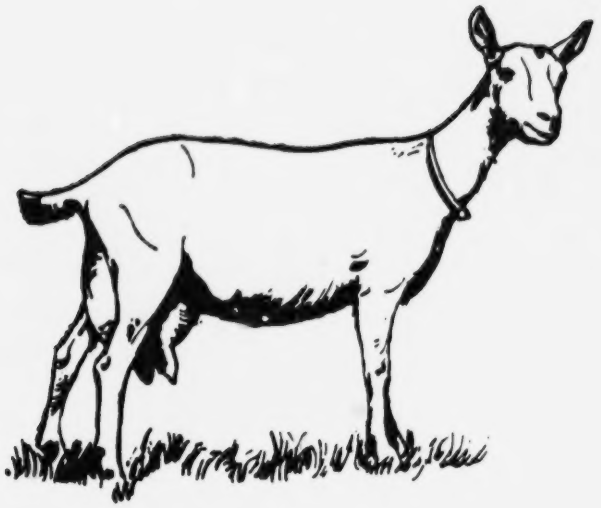
2. Have students develop a disease and parasite control program using resource materials.

3. Discuss disease and parasite control with class.

*Information from "A Dairy Goat for Home Milk Production", United States Department of Agriculture

APPENDICES

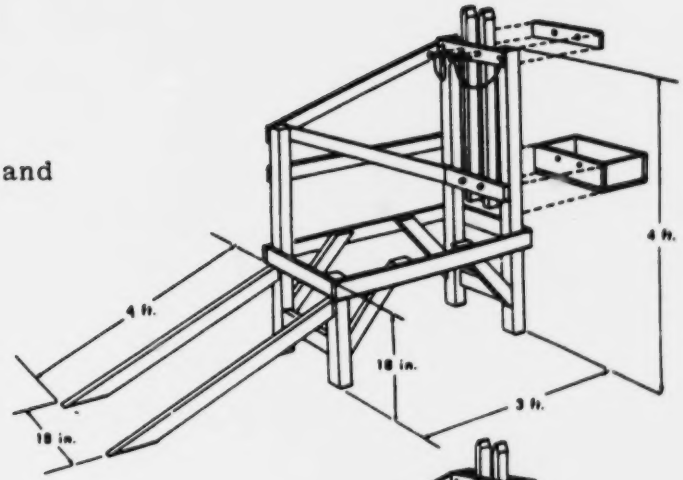
Appendix A



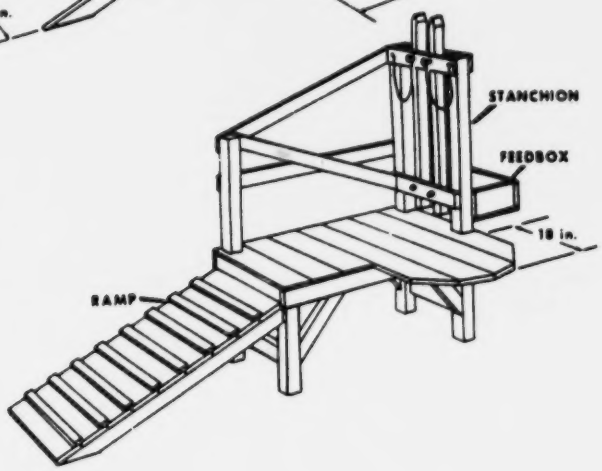
This does has the alertness, size, healthy coat, and well-developed udder of a good dairy goat. She is lean and angular without fat. She stands erectly, which shows the good condition of her feet and legs.

APPENDIX B

Frame for milking stand

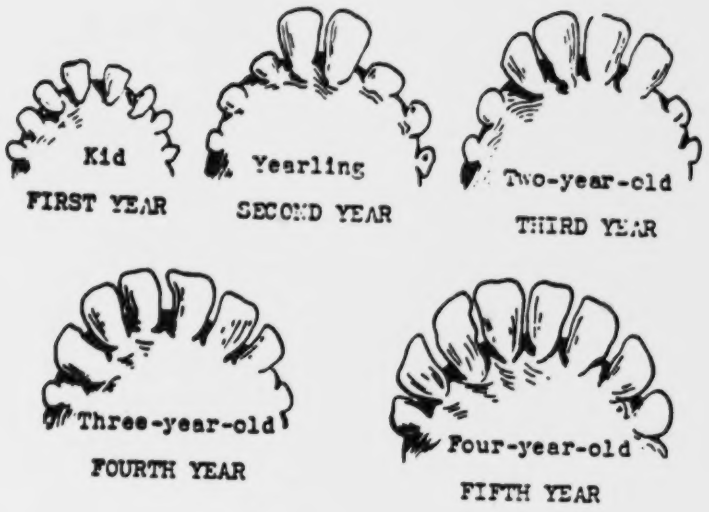


Finished milking stand



APPENDIX C

Determining the age of goats by examination of the eight front teeth on the lower jaw.



UNIT VIII TEST

1. From the characteristics listed, check those that are important to the selection and purchasing of dairy goats for home production:

_____ a. a reliable breeder

_____ b. quarters and pens in which goats have been kept were clean

_____ c. production records

_____ d. horn shape

_____ e. skin and hair coat

_____ f. condition of hoof

_____ g. eye color

_____ h. condition of teeth

2. Match the following:

_____	white or cream in color with white preferred	A.	Nubian
_____	absent or very short ears	B.	American La Moncha
_____	very large rangy body	C.	Saanen
_____	highest percentage of butterfat production	D.	French Alpine
_____	fawn to dark chocolate hair color with white marking	E.	Toggenbury

3. Match the following:

____	fresh or pregnant doe on good pasture	A.	no concentrate or grain
____	dry nonpregnant does	B.	iodized or black salt
____	does not on pasture	C.	1 to 1 1/2 quarts of concentrate
____	all does at all times	D.	2 to 3 lbs of hay

4. Explain the proper methods and management used in tethering a dairy goat.

5. List four management procedures used in milking dairy goats.

6. List four management procedures used in the breeding and reproduction of dairy goats.

7. List three health management procedures used in dairy goats.

UNIT VIII TEST
ANSWER KEY

1. a
   b
   c
   e
   f
   h

2. c
   b
   d
   a
   e

3. c
   a
   d
   b

4. Place an iron stake securely in the ground. Fasten a chain to the stake and the other end to a leather strap to go around the goat's neck. Milk the doe in the morning and tether her in a pasture. Check her occasionally to make sure she does not get entangled in the chain. Move her several times a day. See that there is clean, fresh water within her reach. In the evening, take the doe in, milk and feed her, and put her in the shelter.

5. a. keep milking area and utensils clean

   b. wash or wipe udder

   c. discard first few streams of milk from each teat

   d. use a milking stand

   e. feed grain while milking

   f. use regular milking schedule

   g. have same person do the milking each day

   h. strain milk

   i. cool milk

   j. wash all pans and pails properly

6. a. assure that does are in peak condition for breeding

   b. have your does bred if you have one or two does

   c. use a buck whose daughters have a good production record

   d. put doe in small pen a few days before kidding

   e. provide clean dry bedding and fresh water in kidding pen

   f. find or give doe assistance with kidding if she unsuccessfully attempts giving birth for one hour

   g. dry and clean kids with clean cloth after birth

   h. if kids do not nurse within 2 to 3 hours after birth, take milk from doe and feed kids

   i. let kids nurse for 3 or 4 days and then train them to drink from a pan

   j. sell buck kids for meat at 2 to 4 months of age

   k. keep doe kids from high producing does

7. a. keep facilities clean

   b. protect goats from winter cold and dampness

   c. trim hoofs and keep pens dry to control foot rot

   d. select parasite controls that do not greatly affect milk quality or production

EVALUATION AND TESTING

Ways to Evaluate Pupil Growth

*Class participation

*Students' demonstrating skills at school, farm, campus or on an individual's farm

*Unit test

EQUIPMENT AND SUPPLIES

Student

Reference material
Notebook

Teacher

Goat milk and the dairy goat products
Reference material
Brochures
Pamphlets
Bulletin board supplies
Overhead projector
Transparencies
Filmstrip projector and cassette tape player
Cassette sound film strip
Slide projector

Bulletin Board Ideas

Prepare bulletin boards using brochures and pamphlets listed in the supplementary materials section of this lesson.

SUPPLEMENTARY MATERIALS

Reference Booklets

Colby, B.E., D.A. Evans, S.J. Lyford, W.B. Nutting and D.N. Stern. Dairy Goats Breeding/Feeding/Management. American Dairy Goat Association, Box 186, Spindale, NC 28160.

Booklets on the following subjects are available through Dairy Goat Journal, P. O. Box 1908, Scottsdale, AZ 85252.

Butter from Goat Milk and Home Cheese Making.

Magazines

Dairy Goat Journal. Published at P. O. Box 1908, Scottsdale, AZ 85252. Kent Leach, Ed.

Reference Pamphlets

Pamphlets on the following subjects are available through the American Supply House, P. O. Box 1114, Columbia, MO 65201.

Tips on Kid Care; Buying Goats; The Care of Goat Milk in the Home; Breeding, Pregnancy and Care of the Doe at Kidding; Tainted Milk, Its Causes and Remedies; Goat Manure as Fertilizer; Let's Get It Straight About Brucella Infection; How to Evaluate Your Goat; Kid Rearing with Dry Skim Milk.

Filmstrips with Cassette Sound

Available on the following subjects through Vocational Education Productions, California Polytechnic State University, San Luis Obispo, CA 93407.

Dairy Goat Management; Fitting and Showing Dairy Goats; Ewe and Lamb Management.

Slide Sets

Breeds of Sheep and Goats, available from Vocational Instructional Services, P. O. Box 182, College Station, TX 77843.